

ANNUAL REPORT 1961
COOK INLET AREA
COMMERCIAL FISHERIES DIVISION
ALASKA DEPARTMENT OF FISH AND GAME

Area Biologist: C. A. Weberg, January to October 15, 1961
Jim D. Rearden, October 15 to December 31, 1961

Management Biologists: Jim D. Rearden and Ben Hilliker

TABLE OF CONTENTS

Introduction	1
Licenses, 1961	4
Salmon Processors	5
Fresh, Frozen, Smoked, and Canned Fishery Products Processors	6
Tables	
Weekly Pack by Companies	
Berman Packing Company	8
Columbia-Wards Fisheries	9
Emard Packing Company	10
Halibut Producers Co-op	11
Hallstead Packing Company	12
Kenai Packers	13
Port Chatham Packing Company	14
Seldovia-Port Graham Consolidation	15
Charles L. Simon Seafoods	16
Snug Harbor Packing Company	17
1961 Salmon Pack by Companies	18
Freezer and Smoking Operations	19
Salmon Catch by Statistical Area and Gear	20
Total Cumulative Pack Cook Inlet, 1961	21
Shellfish	22
Tables	
King Crab Production of Kachemak Bay, 1959-1961	25
Partial Sample King Crab Production, Kachemak Bay, Winter Fishery	26
King Crab Average Weights from Cook Inlet, 1953-1961, Sample of Landings Only	27
King Crab Catch from Cook Inlet Since 1951	28
Location and Number of Tags Released in Cook Inlet and Adjacent Areas	29
Salmons.	32
Fritz Creek Transplant	34
Use of Sonar for Counting Salmon	
Feasibility Survey Salmon Counting by Acoustic Means	41
Proposal for an Acoustic Salmon Counting System	55

Herring	64
Stream Clearance	65
Cook Inlet Salmon Counting Stations	67
Temporary Employees	71
Field Announcements	73
Observations on Offshore Seismographic Work	97
Fishermen's Corner	111
Needs for Future	111

INTRODUCTION

This year, 1961, was the second year of Alaskan management of the resource. It was a year of settling down, of streamlining procedures and policies, of taking a better look at problems of the area. Regulation changes were fairly extensive, for the reason that the 1960 regulations were based largely on those of the former managing agency. After one season certain changes were felt necessary, and these were made. It is expected that future regulatory changes will be less extensive. This year saw also the loss of C. A. "Bud" Weberg to the area, when he was transferred to Juneau to assume the position of Director of Protection. His knowledge and experience will be missed in Cook Inlet. His transfer came at a time when a larger staff was needed in the area, rather than a smaller one.

For the second consecutive year king crab production in Cook Inlet set a record, mostly because of the expansion of the fishery from Kachemak Bay to the Kamishak Bay District. Department policy in establishing a no pot limit for king crab in the Kamishak District was primarily responsible for this. The Kamishak Bay District is a problem management-wise for both salmon and king crab. Weather in the area is normally so violent that harvesting any species has always been a problem and undoubtedly will continue to be a problem.

Two vessels were lost in the area, with crews of three each, during 1961. The "Silver Star" from Seldovia was lost with all hands in the Sukoi Bay area, and the "Ruth L.", also working out of Seldovia, was lost somewhere between Cape Douglas and Seldovia. No trace of the "Ruth L." has

been found. The "Silver Star" was a 50-foot Alaska limit seine type boat, the "Ruth L." was in the 75-foot class. Both were manned by experienced fishermen who knew the area.

Also during 1961 the best red salmon pack since 1956 was made, with the drift fleet taking the bulk of the fish taken above Anchor Point. Fish were so numerous during one week that several packers requested that one 24 hour fishing period be cut to 12 hours, or cut entirely. Since there was an abundance of fish the Department took the stand that if the packers couldn't handle the fish it was up to them to put their fishermen on a limit. This the packers refused to do, and the Department refused to close the season. A mild southwesterly blow reduced the catch during the period in question, and the packers were able to handle everything delivered to them.

A transplant of 2,000 adult sexually ripe pink salmon was made into Fritz Creek, in Kachemak Bay, from China Poot, 14 miles across the Bay. This was the first such type plant made in the Cook Inlet Area of which we have record. The fish spawned and seemingly made themselves quite at home in their new stream. The first return on this plant should occur in 1963.

A sonar engineer from Bendix Corporation of North Hollywood, California, spent a short time in the area, on contract, to determine the feasibility of developing sonar equipment for counting migrating salmon. The formal report by that engineer is incorporated into this report. His belief that " . . . the design of a practical system appears feasible," could point toward a major break-through for management of Cook Inlet's salmon runs.

The need for warehouse, office, and outside storage space was becoming acute during the year. In late 1961 negotiations and plans for construction of a leased building were started.

Accelerated oil exploration activity throughout the Inlet during the year kept staff members busy issuing permits and attempting to inspect and keep up with field operations of the seismic crews.

The year ended with very definite progress having been made. It also ended with a shortage of staff members, with the prospect of having to find and break in a new management biologist. A request for a third salmon biologist was denied, despite the tremendous work load that has been carried by the staff of two. The year 1962 promises to be a busy one, for it will take an all out effort for the staff to continue the programs already under way.

LICENSES

COOK INLET - 1961

	<u>Resident</u>	<u>Non-Resident</u>	<u>Total</u>
Commercial fishermen	1,347	295	1,642
Troll	8	0	8
Long line	29	0	29
Drift gill net	279	93	372
Set net	568	22	590
Beach seine	3	0	3
Hand purse seine	85	4	89
Beam trawl	2	0	2
Otter trawl	16	4	20
Shellfish pot	86	5	91
Clam digger	64	20	84
Dory	544	20	564
Vessel	347	109	456

COOK INLET - RESURRECTION BAY AREA

SALMON PROCESSORS

<u>Name and Business Address</u>	<u>Superintendent</u>	<u>Plant Location</u>	<u>No. Lines</u>
Alaska Packers Association* 412 Bell Street Terminal Seattle 1, Washington	Vernon Hilliker	Larsen Bay	2 - 1 lb. 1 - ½ lb.
Columbia-Wards Fisheries P. O. Box 30 University Station Seattle 5, Washington	A. R. Pearmain	Kenai	1 - 1 lb. 1 - ½ lb. 1 - ¼ lb.
Emard Packing Company, Inc. 611 Lowman Building Seattle 4, Washington	S. T. Olson	Anchorage	1 - 1 lb. 1 - ½ lb.
Hallstead Packing Company or Inlet Queen Packing Company Homer, Alaska	Earl Hallstead	Kasitsna Bay	1 - ½ lb. Hand Pack
Kenai Packers 2601 - 42nd Avenue West Seattle 99, Washington	H. A. Daubenspeck	Kenai	1 - 1 lb. 1 - ½ lb.
Seldovia-Port Graham Consol. 2360 Commodore Way Seattle 99, Washington Composed of:	J. J. Lind	Seldovia	1 - 1 lb. 1 - ½ lb.
-Pacific American Fisheries	Victor Olsen	Seldovia	
-Port Chatham Packing Co., Inc.	Erling Nilson	Seldovia	
-Fidalgo Island Packing Company	J. J. Lind	Seldovia	
-Cook Inlet Packing Company		Seldovia	
-Whitney and Company		Seldovia	
Charles L. Simon Seafoods Box 27 Kasilof, Alaska	Charles L. Simon	Kasilof	Hand Pack

*Processed in Kodiak

FRESH FROZEN, SMOKED, AND CANNED FISHERY PRODUCTS

PROCESSORS

<u>Name and Business Address</u>	<u>Superintendent</u>	<u>Plant Location</u>	<u>Product</u>
Alaska Fish and Farm Products, Inc. Box 74 Anchorage, Alaska	K. C. Britt	Anchorage	Salmon Halibut
Alaska Star, Inc. 1206 West 29th Place Spenard, Alaska	Walter B. Swanson	Beluga River	Salmon
Alaskan Sea Foods Box 152 Homer, Alaska	Eugene V. Browning	Homer	Salmon Halibut Crab Shrimp
Alida's Alaskan Gifts Box 62 Anchor Point, Alaska	Ray Charlton	Anchor Point	Salmon
Berman Packing Company 1808 Northern Life Tower Seattle, Washington	O. R. Bertosen	Ninilchik	Salmon Crab Shrimp
Eastpoint Seafood Company Box 677 Seward, Alaska	James Major	Seward	Shrimp
Martin L. Goresen Box 1436 Seldovia, Alaska	Martin L. Goresen	Seward	Crab Shrimp Clams
Ralph Grosvold Box 234 Seldovia, Alaska	Ralph Grosvold	Homer	Salmon Halibut Herring Crab Shrimp Clams
Halibut Producers Co-op Box 796 Seward, Alaska	Hal M. Drinkall	Seward	Salmon Halibut Crab Shrimp
Harrington's Fish Shack Anchor Point, Alaska	Vern Harrington	Anchor Point	Salmon Halibut

FRESH, FROZEN, SMOKED, AND CANNED FISHERY PRODUCTS

PROCESSORS (Continued)

<u>Name and Business Address</u>	<u>Superintendent</u>	<u>Plant Location</u>	<u>Product</u>
Torvald Jensen Box 123 Ninilchik, Alaska	Torvald Jensen	Deep Creek	Salmon
Kachemak Bay Packing Company Box 455 Homer, Alaska	Robert D. Schawl	Homer	Crab Shrimp
Keener Packing Company Clam Gulch, Alaska	Leonard A. Keener	Clam Gulch	Salmon
New Nelco, Inc. 527 Finch Building Aberdeen, Washington	Floater: NELCO I	Central Alaska	Crab
Port Chatham Packing Company 632 West 46th Seattle 7, Washington	Kal J. Miller	Portlock	Salmon
R. Lee Company Soldotna, Alaska	R. L. Schmidt	Kalifonski Beach	Salmon
Snug Harbor Packing Company 204 Administration Building Fisherman's Terminal Seattle 99, Washington	Joe Fribrock	Snug Harbor	Salmon
Sportsman's Cannery Mile 124½ Sterling Highway Clam Gulch, Alaska	Ray LaFrenere	Clam Gulch	Salmon
Sutterlin and Wendt 701 Central Building Seattle 4, Washington	Richard Sutterlin	Seldovia	Crab Shrimp
Ursin's Seafoods Seldovia, Alaska	Norman Ursin	Seldovia	Salmon Halibut Herring Cod Crab Shrimp Clams Octopus
Wakefield Fisheries Seldovia, Alaska	Charles Hendrix	Seldovia	Salmon Halibut Crab

COOK INLET PACK BY WEEK - 1961

BERMAN PACKING COMPANY

(Frozen Fish)

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11						
June 18						
June 25						
July 2						
July 9						
July 16						
July 23						
July 30						
August 6						
August 13						
August 20	15	2	863	1		881
August 27	—	—	—	—		—
Total	15	2	863	1		881

COOK INLET PACK BY WEEK - 1961*

COLUMBIA-WARDS FISHERIES

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11	141	116				257
June 18	126	199		1		326
June 25	27	182		40		249
July 2	26	444		37	10	517
July 9	71	2,415	6	45	544	3,081
July 16	123	7,822	134	144	1,961	10,184
July 23	186	12,407	327	78	2,038	15,036
July 30	41	809	117	32	615	1,614
August 6	120	176	352		743	1,391
August 13	25	42	192		3	262
August 20						
August 27	—	—	—	—	—	—
Total	886	24,612	1,128	377	5,914	32,917

*All weekly packs based on 48 - 1# tails, unless otherwise indicated.

COOK INLET PACK BY WEEK - 1961

EMARD PACKING COMPANY

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cahos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11	587	42				629
June 18	1,720	89		4		1,813
June 25	87	36		49		172
July 2	31	121		54	3	209
July 9	7	698	10	51	213	979
July 16	5	671	168	190	311	1,345
July 23		3,524	1,642	179	1,543	6,888
July 30		490	505	20	314	1,329
August 6	36	72	821		1,776	2,705
August 13		6	192		505	703
August 20						
August 27	_____	_____	_____	_____	_____	_____
Total	2,473	5,749	3,338	547	4,665	16,772

COOK INLET PACK BY WEEK - 1961

HALIBUT PRODUCERS CO-OP

(Frozen Fish - Pounds)

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11						
June 18	1,420					1,420
June 25						
July 2	1,280		92	10		1,382
July 9						
July 16	419	12,785	1,666	6,286		21,156
July 23	52	708		2,868		3,628
July 30	2,508	11	15,669	442		18,630
August 6	102	402	26,266	502	584	27,856
August 13	9		6,638	60,551	992	68,190
August 20	7		26,668	62,612	3,614	92,901
August 27	<u>23</u>	<u> </u>	<u>10,215</u>	<u>41</u>	<u>10</u>	<u>10,289</u>
Total	5,820	13,906	87,214	133,312	5,200	245,452

COOK INLET PACK BY WEEK - 1961

HALLSTEAD PACKING COMPANY

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11						
June 18		6				6
June 25	5	1				6
July 2		1				1
July 9						
July 16		4		2		6
July 23						
July 30						
August 6						
August 13						
August 20						
August 27	—	—		—		—
Total	5	12		2		19

COOK INLET PACK BY WEEK - 1961

KENAI PACKERS

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11	494	239				733
June 18	592	268				860
June 25	70	235		50		355
July 2		460		16		476
July 9	107	2,855	10	46	677	3,695
July 16	70	1,607	156	102	1,540	3,475
July 23	236	24,924	655	206	3,309	29,330
July 30	53	560	449	13	596	1,671
August 6	68	263	594		812	1,737
August 13		Pack record not correct this week				
August 20	436		893		8	1,337
August 27	_____	_____	_____	_____	_____	_____
Total	2,126	31,411	2,757	433	6,942	43,669

COOK INLET PACK BY WEEK - 1961

PORT CHATHAM PACKING COMPANY

(Salt - Mildcure)

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11	1,041					1,041
June 18	419					419
June 25	99					99
July 2	62				344	406
July 9						
July 16					103	103
July 23	2		10		377	389
July 30			25		328	353
August 6					311	311
August 13						
August 20						
August 27	—		—		—	—
Total	1,623		35		1,463	3,121

COOK INLET PACK BY WEEK - 1961

SELDOVIA-PORT GRAHAM CONSOLIDATION

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11		210			1	211
June 18		171		2	9	182
June 25		226		161	46	433
July 2	1	552		980	142	1,675
July 9	12	2,492	20	1,697	2,585	6,806
July 16	14	11,722	236	2,661	3,678	18,311
July 23*	4	20,022	924	1,909	4,905	27,764
July 30**	4	1,225	432	4,034	3,074	8,769
August 6	1	109	417	12,166	2,299	14,992
August 13	2	9	489	9,792	886	11,178
August 20		27	381	6,602	1,950	8,960
August 27	—	—	—	—	—	—
Total	38	36,765	2,899	40,004	19,575	99,281

*Packed in Kodiak	4,087	92	15	1,167	5,361
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**Packed in Kodiak	4,453	50	18	1,236	5,757
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COOK INLET PACK BY WEEK - 1961

CHARLES L. SIMON SEAFOODS

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11						
June 18						
June 25						
July 2						
July 9						
July 16						
July 23						
July 30	5	15				20
August 6	5	10				15
August 13						
August 20						
August 27	—	—				—
Total	10	25				35

COOK INLET PACK BY WEEK - 1961

SNUG HARBOR PACKING COMPANY

(Frozen Fish)

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11						
June 18						
June 25						
July 2						
July 9						
July 16						
July 23			40		120	160
July 30			250		2,017	2,267
August 6			93	2	252	347
August 13						
August 20						
August 27			—	—	—	—
Total			383	2	2,389	2,774

1961 SALMON PACK BY COMPANIES

(Basis 48/lb Per Case)

<u>Company Name</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
Columbia-Wards Fisheries	886	24,612	1,128	377	5,914	32,917
Emard Packing Company	2,473	5,749	3,338	547	4,665	16,772
Hallstead Packing Company	5	12		2		19
Kenai Packers	2,126	31,411	2,757	433	6,942	43,669
Saldovia-Port Graham	38	36,765	2,899	40,004	19,575	99,281
Charles L. Simon	<u>10</u>	<u>25</u>	<u> </u>	<u> </u>	<u> </u>	<u>35</u>
Total Cases	5,538	98,574	10,122	41,363	37,096	192,693

FREEZER AND SMOKING OPERATIONS

(Individual Fish)

<u>Company Name</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
Alaska Star Inc.	15	3	10		1	29
Alida's Alaskan Gifts		4	33			37
Berman Packing Co.	15	2	863	1		881
Harrington's Fish Shack	1	12	4	3	55	75
Port Chatham Packing Co.	1,623		35		1,463	3,121
Sportsman's Cannery			20		30	50
Snug Harbor Packing Co.			383	2	2,389	2,774
Torvald Jensen	<u>22</u>	<u>51</u>	<u>133</u>	<u>-</u>	<u>498</u>	<u>704</u>
Total Individual Fish	1,676	72	1,481	6	4,436	7,671

FREEZER OPERATIONS

(Pounds of Fish)

Alaska Fish and Farm	28,800					28,800
Halibut Producers Co-op	5,820	13,906	87,214	133,312	5,200	245,452
Keener Packing Co.			432			432
Charles L. Simon	240		1,070			1,310
R. Lee Co.		10	1,905			1,915
Ursin Seafoods	<u> </u>	<u> </u>	<u>762</u>	<u> </u>	<u> </u>	<u>762</u>
Total Pounds of Fish	34,860	13,916	91,383	133,312	5,200	278,671

SALMON CATCH BY STATISTICAL AREA AND GEAR - 1961

<u>Area</u>	<u>Gear</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>
232	Hand Purse Seine	2	12,503	285	10,270	1,657 = 24,717
241	Hand Purse Seine	24	1,549	945	183,710	2,499 = 188,727
241	Set Gill Net	15	8,631	216	8,201	425 = 17,488
242	Hand Purse Seine		92	159	95,177	38,547 = 133,975
243	Hand Purse Seine				2	541 = 543
244	Drift Gill Net	221	636,115	18,301	5,878	223,353 = 883,868
244	Set Gill Net	6,237	244,229	21,072	11,352	516 = 283,400
245	Drift Gill Net	1,012	83,167	3,165	1,048	36,637 = 125,029
245	Set Gill Net	3,228	29,620	24,342	3,460	21,932 = 82,482
246	Drift Gill Net	3	12,655	425	69	4,511 = 17,663
246	Set Gill Net	1,281	79,143	9,370	1,445	1,576 = 92,815
247	Drift Gill Net		235		24	31 = 290
247	Set Gill Net	7,755	77,139	40,975	10,741	61,072 = 197,652
248	Hand Purse Seine		1	14	6,017	11,924 = 17,956
		19,778	1,185,079	119,269	337,394	405,221

TOTAL CUMULATIVE PACK COOK INLET - 1961

<u>Week Ending</u>	<u>Kings</u>	<u>Reds</u>	<u>Cohos</u>	<u>Pinks</u>	<u>Chums</u>	<u>Total</u>
June 11	1,222	607			1	1,830
June 18	3,660	1,340		7	10	5,017
June 25	3,849	2,020		307	56	6,232
July 2	3,907	3,598		1,394	211	9,110 ✓
July 9	4,104	12,058	46	3,233	4,230	23,671
July 16	4,316	33,884	740	6,332	11,720	56,992 ✓
July 23	4,742	94,761	4,288	8,704	23,515	136,010
July 30	4,845	97,860	5,791	12,803	28,114	149,413
August 6	5,075	98,490	7,975	24,969	33,744	170,253
August 13	5,102	98,547	8,848	34,761	35,138	182,396
August 20	5,538	98,574	10,122	41,363	37,096	192,693
August 27	5,538	98,574	10,122	41,363	37,096	192,693

SHELLFISH

King Crab:

Production of king crab in Cook Inlet for 1961 exceeded the record catch of 1960, even though the catch from Kachemak Bay was below that of last year (Table I). The increased catch of 1961 was due primarily to expansion of fishing effort to the Kamishak Bay District on the west side of Cook Inlet. This district produced 1,205,679 pounds of king crab during 1961; and 1961 was the first year that boats fishing from Seldovia and Homer ventured away from Kachemak Bay for king crab fishing. A fishery was also conducted in the area of Chugach Bay on the Gulf of Alaska for the second consecutive year, and though total production was only 61,837 pounds there is every indication that the king crab fishery will expand to that area in the future.

During 1961 the average weight of crab taken from Kachemak Bay showed a decrease from those taken from the same area in 1960. The weeks of heavy production on the migratory or off shore populations of crab in both 1960 and 1961 showed a very similar average weight relationship (Table II). The decrease in weight can be attributed to the fishing intensity on smaller crab taken during the summer and early autumn months. The fishing pressure on smaller crab was extremely heavy during both 1960 and 1961. Should Kachemak Bay prove to be the nursery area and point of origin of the migratory crab stocks that enter the bay during winter and spring, then subsequent years should show a marked decline in both size and numbers of crab in the winter fishery. If on the other hand the winter crab stocks are recruited from areas other than Kachemak Bay such as Kamishak Bay, or the Gulf of Alaska, this fishery should remain static for quite some time.

The king crab fishery of Cook Inlet started on a seasonal basis, and only since 1958 has there been any attempt to fish throughout the year. This fishery has always been conducted for the most part within the geographical limits of Kachemak Bay and the catch has apparently not affected or influenced the size of the winter crab population. More information is needed to determine the origin of the migratory crab stocks, and if possible geographical range and distribution should be learned of these stocks when they are outside the scope of the present fishing operations.

As previously mentioned there was a marked decline in crab average weights in 1961 over that of 1960. This fluctuation has been in evidence in the king crab fishery of Cook Inlet since 1954. Although early records are not complete for the entire production of the respective years a sporadic rise and fall can be noted (Table III). It should be pointed out again that the early fishery was confined almost exclusively to the months of August, September and October. The past ten years of king crab production show an inconsistent though generally increasing rise, except for 1957 and 1958 when little or no fishing effort was made (Table IV).

A tagging program and life history study of the Cook Inlet crab population was initiated in 1957 by the U. S. Fish and Wildlife Service. Since its inception approximately 13,000 king crab have been tagged in Cook Inlet and adjacent areas (Table V). This program has furnished information on the growth of male and female crab, migratory patterns and routes, as well as some of the oceanographic conditions of Kachemak Bay. A number of king crab were tagged in Tutka Bay in 1961 to check tag retention and crab mortality. Double marking was used: a standard loop tag with numbered disk were attached, and at the same time, sub orbital spines were clipped. This program and the population

enumeration tagging study of 1960 conducted in Kachemak Bay both are continuing. Tags from the years 1957 through 1959 are still being returned by fishermen. All of these data will soon be available to aid in management of the Cook Inlet crab stocks.

Compared to other fisheries of the area the Cook Inlet king crab fishery is relatively new, however in its short existence it has enhanced economic growth and stability on the Kenai Peninsula.

TABLE I

KING CRAB PRODUCTION OF KACHEMAK BAY - 1959 TO 1961

YEAR	NOS. OF CRAB	TOTAL WEIGHT	AVERAGE WEIGHT
1959	234,626	2,191,437	9.3
1960	455,000	4,219,776	9.2
1961*	349,783	2,988,880	8.5

KING CRAB PRODUCTION OF OUTER DISTRICT - 1960 TO 1961

1960	9,224	67,656	7.3
1961*	6,598	61,837	9.3

KING CRAB PRODUCTION OF KAMISHAK BAY DISTRICT - 1961

1961*	139,300	1,205,679	8.6
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*Figures through December 18, 1961.

TABLE II
PARTIAL SAMPLE
KING CRAB PRODUCTION
KACHEMAK BAY - WINTER FISHERY

YEAR	WEEK	BOATS	LANDINGS	CRAB	WEIGHT	AVERAGE WEIGHT
1960	5	20	71	9,359	104,319	11.14
1960	6	21	77	14,397	161,760	11.23
1960	7	24	116	24,646	269,725	10.94
1960	8	26	94	19,098	206,242	10.79
1960	9	25	121	26,146	282,980	10.82
1961	5	33	140	13,381	144,165	10.77
1961	6	34	132	17,670	193,413	10.94
1961	7	36	135	14,062	151,522	10.77
1961	8	35	108	10,030	104,987	10.46
1961	9	31	71	3,981	39,830	10.0

TABLE III

KING CRAB AVERAGE WEIGHTS FROM COOK INLET - 1953 TO 1961
SAMPLE OF LANDINGS ONLY -- EARLY YEARS DATA NOT COMPLETE

YEAR	NUMBER	POUNDS	AVERAGE
1954	93,812	729,064	7.7
1955	46,340	382,726	8.2
1956	68,888	615,151	8.9
1957	26,499	221,120	8.3
1958	48,739	486,799	9.9
1959	234,626	2,191,437	9.3
1960	463,224	4,287,432	9.2
1961*	495,681	4,256,396	8.6

*Through December 18, 1961.

TABLE IV
KING CRAB CATCH FROM COOK INLET SINCE 1951

1951	6,619
1952	2,900
1953	1,359,854
1954	1,275,852
1955	1,915,821
1956	2,129,035
1957	620,858*
1958	752,990*
1959	2,191,437
1960	4,069,692
1961	4,324,118

*Very little fishing effort, four or five boats.

TABLE V

LOCATION AND NUMBER OF TAGS RELEASED IN COOK INLET AND ADJACENT AREAS

AREA	1957	1958	1959	1960	1961
Upper Kachemak	3,728	880	127	850	
Lower Kachemak	837	573	689	2,109	
Kamishak Bay		83			
Seldovia Bay	159				
Tutka Bay					1,100
Tuxedni Channel	13	2			
Port Graham	99	29			
Port Chatham	66	48			
Windy-Rocky Bay		645	175		
Cook Inlet	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>690</u>
	4,934	2,260	991	2,954	1,790

TOTAL TAGGED SINCE 1957 . . 12,929

Dungeness Crab:

A Dungeness crab fishery was engaged in during 1961 by ten boats from Seldovia and Homer. The fishery was within Kachemak Bay and all processing was aboard a floating cannery anchored in Halibut Cove. This vessel moved into Cook Inlet in mid-October from Prince William Sound. Pots and bait were supplied local fishermen for the operation.

From October 16 until November 23rd, 191,588 pounds of Dungeness crab were taken, mostly from the area above the Homer Spit. The operation was primarily exploratory. Though the fishery lasted slightly over a month there was much optimism over a continuing Dungeness crab fishery in the area.

With this prospect in mind, the fishermen who engaged in the 1961 fishery recommended that a 100 pot limit be established in Cook Inlet west of Gore Point, and a 250 pot limit be established east of Gore Point. These recommendations were made to the Board of Fish and Game during December, and accepted by the Board.

The last year of commercial fishing for Dungeness crab in Cook Inlet was in 1958 when 10,982 pounds were taken from Kachemak Bay. During 1951, the last significant catch was made, when 1,540,670 pounds were taken from Kachemak Bay.

Shrimp:

The shrimp catch from Cook Inlet for 1961 was 1,045,170 pounds (compared to 711,355 pounds for 1960). This catch was taken, as in previous years, primarily from Kachemak Bay, the Nuka Pass area, and near Bear Glacier. Shrimp processing plants in Seward and Seldovia handled the bulk of the catch. A few pot caught shrimp were sold on local markets or to small processors.

August and September produced the best catches, and of the total 639,269 pounds were taken during these months.

Razor Clam:

A commercial razor clam fishery at Polly Creek, on the west side of Cook Inlet, which has existed sporadically for over 30 years, was active in 1961. Between April 4 and July 8, 4,447 boxes weighing 244,585 pounds were taken by 84 diggers and transported to Kodiak for processing. By comparison the 1960 harvest for Polly Creek was 6,779 boxes weighing 372,872 pounds.

Severe spring weather hampered early digging at Polly Creek. The week June 26 through July 1 produced the best yield, with 1,358 boxes being dug in that time.

SALMON

Outstanding during the 1961 salmon season in Cook Inlet was the red pack of 98,564 cases, which was about 12,000 cases over the ten year average, and the best red pack since 1936 (when 110,000 cases were packed). During one 24-hour fishing period (July 17) approximately 500,000 salmon were caught in the upper Inlet (above Anchor Point). On July 20 another approximately 300,000 salmon were caught in the same area. Most of these fish were red salmon, and the bulk of them were caught by drift boats.

Normally drift boats catch around 25 percent of the red salmon in Cook Inlet. During 1961 drift boats caught 61 percent of this species. On the 20th day of July a southwest blow reduced fishing effort and pushed fish onto the beaches in the vicinity of the Kenai and Kasilof Rivers. These fish quickly entered the streams and left the fishery. Consequently the set net fishery caught but 36 percent of the red salmon instead of the usual 50 to 70 percent.

The 1961 king pack was poor, as it has been for the past five to six years, with but 5,133 cases packed despite a season opening approximately two weeks later than usual. The late opening was made to protect king salmon. The chum, pink, and coho packs were likewise weak. Final pack all species of 191,914 cases was about 32,000 under the average of the past ten odd numbered years.

Escapement:

Red salmon escapement into the Tustumena Lake and Kenai River drainages was excellent, although the Kenai system's escapement was not reflected by the Russian River counting tower figure of 22,814 (compared with 37,680 for



Hand purse seine with nearly 10,000 pink salmon
in it--Tutka Bay Lagoon, special opening.

1960, the first year counts were made at this point).

Escapement into the Susitna Basin was not completely evaluated. The area involved was too great for the crews allowed by budget limitations. Indications were that escapement was below normal.

Extremely persistent bad weather made it impossible to properly make aerial surveys of escapement in the Kamishak District. Weather was so bad that few fishermen managed to reach the area even though five day a week fishing was allowed in this district. Pink and chum escapement was considered good for an odd numbered year in the Southern and Outer Districts (pink runs especially are weak in Cook Inlet on odd numbered years).

West Side Survey:

Little recorded data have been available on streams on the west side of Cook Inlet. Many of these streams are glacial in origin and fish cannot be seen in them, so aerial surveys have not been of much value. During the season of 1961, a crew of two biologists were assigned the job of assessing salmon runs in streams from Chuit River, above the Moquawkie Indian Reservation, south to but not including Chinitna Bay. They were provided with gill nets, camp gear, a radio, and an outboard powered skiff. Streams were covered on foot as well as by boat. Outward migrating smolts as well as spawning age adults were collected and identified.

During the work the biologists recorded information on three relatively important red salmon runs (3,000 to 5,000 total spawners) about which little or nothing was previously known, located three important pink salmon streams that were previously unknown as pink producers, and they gathered important information on distribution of all species of salmon in west side streams.

Fritz Creek Transplant:

INTRODUCTION

Fritz Creek is an 11 mile long, 7-10 foot wide clear water stream that drains into Kachemak Bay, about four miles northeast of Homer. The stream has a gentle gradient with many pools alternating with meandering shallow water runs. The bottom consists primarily of gravel, with some sand and larger water-worn rocks. Natural access for salmon to most of the stream has been prevented by a seven foot waterfall approximately 100 yards from the mouth.

Fifteen or more years ago a good run of silver salmon was known at Fritz Creek. Personal use and commercial fishing is blamed for its disappearance. One old-timer has reported that pink salmon also occurred there. In recent years no salmon have been known to appear in the stream. A few Dolly Varden, of small size have been taken by sport fishermen both above and below the falls.

A 30-foot (three 10-foot sections) Denail type fishway, of heavy gauge aluminum, was constructed for the Fritz Creek falls. Original plans were to introduce live, ripe spawners above the falls, with a fence above the falls to hold fish in the stream, in 1961. Installation of the fishway was planned for the summer of 1962 after the results of the 1961 plant were evaluated.

China Foot stream, on the south side of Kachemak Bay, and about 11 miles from the mouth of Fritz Creek, has a strong pink run each year. China Foot fish are late for Cook Inlet, and normally appear after August first. Frequently the spawning population in China Foot stream has appeared excessive, although evaluation is difficult because of silty water. Much inter-tidal spawning apparently takes place in China Foot, for only about 300 yards of

fresh water stream are accessible to salmon. The stream bottom is composed of a small amount of gravel and an abundance of large rocks.

The timing of the China Foot run, its apparent high productivity, and the relative nearness to Fritz Creek made it ideal as a source of adult spawners.

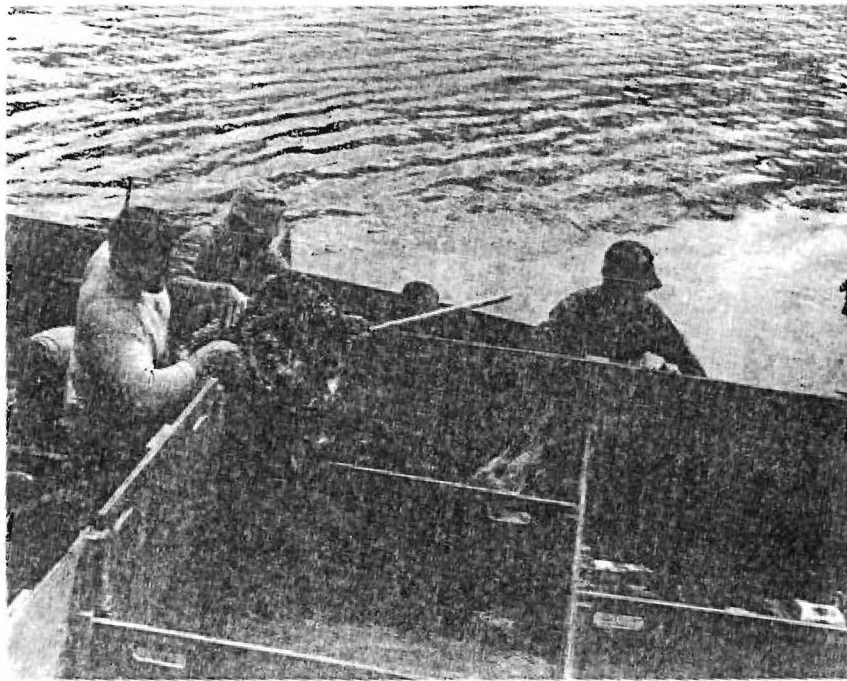
METHODS

A mass plant was desired. This called for a live tank capable of handling many fish, with pumps to circulate water in order to replenish oxygen. For this purpose an 8x12x4 foot tank was constructed of three-quarter inch exterior plywood. It was built on joists of 2x4s. A 2x6 was fitted (large plane horizontal) around the tank one foot from the top and strapped with iron at the corners. A three-foot-wide sliding door was built into one end and four drain holes were spaced near the top to keep the water level at three feet. A bottom drain, with an outside valve, was also included.

Removable baffles were built in the tank to keep sloshing at a minimum. An area of one foot from the bottom was left free of baffles. The entire inside of the tank was coated with fiberglass mat material and fiberglass resin. Lifting straps were provided on the corners. Total weight was about 800 pounds.

Two water pumps provided a continuous flow of water through the tank while salmon were in it. One pump was capable of 5,000 gallons per hour, the second was rated at 3,600 gallons per hour. Exhaust hoses from the pumps were draped over the sides of the tank and lashed into position. An attempt was made to point the outlets of the hoses in the same direction so a circular flow was established. The baffles prevented a violent circular motion.

The intake hoses were sufficiently heavy to remain submerged even when the scow was under way. In operation, hoses were draped over the side of the



tank, all drains were opened and two one and one-quarter inch siphon hoses used to remove water from the tank as it was being pumped in. Minor adjustments resulted in a stable water level.

Floating equipment used included a 55-foot fishing vessel, a 40-foot cannery scow, a seine skiff and five or six outboard powered skiffs. The fishing vessel and seine skiff were under charter, and the owner, under direct supervision of Department biologists, seined the fish, loaded them into the live tank, and towed the scow across Kachemak Bay to Fritz Creek. Hand dip nets were used to transfer the fish to the live tank from the pursed seine on the first day: subsequently a large brailing net and the boom and rigging of the fishing vessel were used to effect this transfer.

Loading and unloading the fish both had to be accomplished at high tide. By working rapidly it was possible to catch fish and load them on the incoming tide, make the hour and three-quarter run to Fritz Creek and unload immediately as the tide was ebbing. In order to prevent the scow and fishing boat from going aground on the ebbing tide, it was necessary to anchor some distance off the mouth of Fritz Creek and relay the fish ashore with skiffs.

On the first day of operation an attempt was made to carry all fish above Fritz Creek falls for release. First the fish were unloaded by hand dip nets (two square-framed ones proved handy in the tank corners) from the live tank into plastic 20 gallon garbage cans (filled with water) in the skiffs. The skiffs were run into Fritz Creek as far as possible. Crews then loaded six to eight fish into a gunny sack and rapidly carried them above the falls for release.

RESULTS

About half of the fish in the load were successfully handled in this

manner (253 fish, 152 females - 101 males) when it became obvious there was not sufficient time to finish before dropping tide would allow the scow and fishing boat to go aground. A length of seine was hastily strung across Fritz Creek and the remainder of fish released directly from the garbage cans into the creek above the seine. Of the fish carried above the falls, two died, and both of these (females) had previously been injured, probably by seals.

While the tide went out and before high tide returned, materials were obtained and a more permanent fish-tight fence erected out of wire and 2x4's. Subsequently, all fish were released above this fence, but below the falls.

Transfer of fish was accomplished on four consecutive days, Sunday - August 26, through Tuesday - August 29, a period of high tides of 21 feet or more, a necessary condition for this particular operation.

TABLE

DAILY TALLY OF FISH TRANSPLANTED FROM CHINA POOT TO FRITZ CREEK

<u>Saturday - August 26:</u>	Total into tank	478
	Total losses	6
	Total into creek	472
<u>Sunday - August 27:</u>	Total into tank	560
	Total losses	0
	Total into creek	560
<u>Monday - August 28:</u>	Total into tank	750
	Died in tank	238
	Died behind fence	100
	Escaped from fence	60*
	Total into creek	352
<u>Tuesday - August 29:</u>	Total into tank	725
	Died in tank	70
	Died behind fence	62
	Total into creek	588
Four day accumulated total into creek:		1,972



Transplanted adult pink salmon in Fritz Creek.

*Those that escaped from behind the fence remained in Fritz Creek and were found, each day until the fence was removed, in the stream below the fence attempting to move upstream.

At the start of the operation it was estimated the tank could successfully hold about 500 adult pink salmon. During the first day's operation fewer than 500 were successfully handled, with practically no loss. On this day the fish were caught on the tail end, or outer edge of the spawning population: they were fresh and fairly bright vigorous fish. Fish taken the second day were also gained from the presumed freshest or brightest portion of the spawners.

However, on the third day, Monday, tide affected the operation in such a manner that fish were more easily taken from somewhat further upstream. The success of the first two days also made it appear that the tank could safely hold more than the 560 carried on the second day.

Fish taken on the third day were older, more worn. Some fungus appeared on them and a number of spawned out individuals were sorted from the catch. They were markedly less vigorous. Also an attempt was made to handle a larger number. All might have gone well but one of the pumps stopped because of fouled plugs: about half an hour passed before it was again running. In this time 238 fish died in the tank.

In addition, upon unloading, 100 fish died after reaching Fritz Creek.

Indications are that with the circulating system used, capacity of the tank is probably about 500 fish that are somewhat advanced in spawning and perhaps 600 bright fish relatively fresh from the sea.

Salmon released into the stream moved to the large pool at the base of the falls very quickly until at one time there were 500 to 600 fish there. From the pool to the fence, 60 to 70 yards, about 1,000 fish lay scattered.

Fish released above the falls moved upstream quickly, some as far as a mile. Spawning activity commenced immediately.

The fishway was installed, temporarily, on Wednesday, August 30, the day following the last plant of fish. About 100 fish successfully ascended it almost immediately. The remainder of the fish remained below the falls, and many of them unquestionably spawned.

On September 3rd, about 300 fish were counted in the stream above the falls. They were all found over gravel beds. Sex ratio of these fish was very close to 50-50. On this date 250 fish were netted from the pool at the base of the falls and released above the falls. This made a total of approximately 600 fish released above the falls.

A final survey was made September 15. Heavy rains had raised water levels several inches higher than at the time of the fish plant. Many dead salmon were seen at the mouth of the creek and along about three-fourths of a mile of the adjoining shore of Kachemak Bay. Three dead females were examined. They had evidently spawned, as each contained fewer than 25 eggs. No live fish were observed above the falls, but visibility was poor. One live fish was seen in the water below the falls.

Insofar as is possible to judge now, the transplant was successful, if spawning salmon in a previously barren stream (for salmon) can be considered the scale of success.

The Beneil type fishway will be permanently installed in Fritz Creek in June of 1962, and a similar transplant operation will be carried out in August of 1962.

The true success of the operation will not be known until 1963, when the first return from the fish that spawned in Fritz Creek this year are due.



The aluminum fishway installed in Frits Creek.

SUMMARY

Fritz Creek, on the lower end of the Kenai Peninsula, at one time supported pink and silver salmon runs. In recent years no salmon have occurred there. An impassable seven foot falls exists 100 yards from the stream mouth.

A 30-foot Deneil type fishway was constructed for the falls. A mass transplant of adult pink salmon spawners was made from China Pool, 11 miles across Kachemak Bay from Fritz Creek.

For this, an 8x12x4 foot plywood tank was used; while fish were in the tank water pumps provided a continuous flow of fresh seawater. Spawning pink salmon were seined, brailled into the tank and transported to Fritz Creek for release. In a four day operation 1,972 fish survived in Fritz Creek; losses totaled 476, of which 308 succumbed in the tank and 168 after release in Fritz Creek.

The fishway was temporarily installed at the falls and about 100 salmon ascended it. Another 503 salmon were carried over the falls in burlap sacks and dip nets. The fish developed sexually and much spawning activity was noted.

The fishway will be permanently installed in June, 1962, and a similar transplant operation will be made in August, 1962.

Use of Sonar For Counting Salmon:

FEASIBILITY SURVEY
SALMON COUNTING BY ACOUSTIC MEANS
COOK INLET AREA
ALASKA

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INTRODUCTION

This report covers the preliminary acoustic and environmental survey of various streams, rivers, and lakes of the Cook Inlet area, State of Alaska. The objective of this survey is that of determining the feasibility of design of an underwater acoustical system which will be used to assess the magnitude of salmon runs. The preliminary survey herein, has been made at the invitation of the Alaska Department of Fish and Game. Mutual interests of Bendix-Pacific and the Department of Fish and Game in development of such a system resulted in financial contributions by both of the participants for the survey. The survey discussed in this report was accomplished during the period of September 26 to October 6, 1961, from the area office at Homer, Alaska.

ACOUSTICAL SURVEY

Experience in the field of underwater acoustics has shown that many variables exist and that propagation of sonic energy through the water varies widely, dependent upon existing conditions. The problem of acoustically illuminating the cross section of a stream or river successfully was approached with these variables in mind.

It is probable that the amount of entrained air or microbubbles in the water is the most critical factor. Other factors which are necessary to consider are the effects of glacial silt, and water borne noise.

Accordingly a preliminary acoustic survey has been made at several areas considered feasible for possible installation of acoustic counting devices. Water conditions at locations investigated are considered to be typical of the many streams and lakes in the Cook Inlet area. Areas

specifically checked by acoustic measurements were:

1. Lower Skilak Lake
2. Kenai River Soldotna Area
3. Russian River at Lower Russian Lake

Other areas visually inspected and considered to be similar in nature were:

1. Lake Tustumena
2. Kasilof River

In addition to the above areas, the Susitna River was observed from the air, inspection was made from various elevations of 200 to 2,000 feet; giving an excellent over-all survey of the river and area. The amount of silt carried by the Susitna is apparently extremely high, resulting in a muddy appearance and visibility through water of essentially zero. The magnitude and turbidity of this river make it a special case and one requiring further study if the present survey and developments, if any, prove to be feasible.

The Deshka River which runs into the Susitna is apparently largely free from mud and silt, but is rendered opaque by the amount of decomposed vegetation carried in the stream. This causes the river to take on a deep brown or tea colored appearance. Conditions in the tributary appear to be more acoustically favorable.

Acoustic Tests

Equipment: 1. Bendix depth recorder DR-17

High Resolution recorder. Maximum operating depth 300 feet.

Operating frequency 200KC. Power requirements 6 V DC - 12 amps.

2. Bendix depth recorder DR-19

Maximum operating depth 300 feet. Operating frequency 75KC.

Power requirements 12 V DC - 4 amps.

3. Triplane target for horizontal ranging

Tests at Skilak Lake

Date: September 30, 1961

Location: Opposite SKI-LA-VISTA cabin at lower end of lake

Width: Approximately 200 yards

Depth: 15 feet maximum (ref depth contours, figure 3)

Bottom: Coarse gravel well rounded making relatively smooth beach and bottom

Water: Opaque due to glacial milk. Surface smooth. Current velocity approximately 2 feet/second. Little or no apparent turbulence

Test 1. Horizontal Ranging on Triplane Target

The triplane was anchored at a depth of 7 feet in water of 15 foot depth. The depth recorders with necessary batteries for primary power were installed in the boat. A 250 foot line was attached to triplane anchor in order to control position and speed of the boat as it was allowed to drift away from the triplane.

DR-17 range on triplane - 240 feet
DR-19 range on triplane - 210 feet maximum

The DR-17 range was limited by the length of available line used to maintain position of boat relative to the triplane. Figures 1 and 2 show results obtained with the DR-17 and DR-19 respectively. The discontinuities or breaks in the DR-17 recording are due to the difficulty in holding the triplane with the narrow (10°) beam of the depth recorder.

Test 2. Cross Section Contours

With transducers maintained at a depth of six inches to one foot under water, bottom contours were run cross channel. Starting point was at the edge of the lake adjacent to SKI-LA-VISTA cabin. The

boat was headed such that a course perpendicular to the channel was obtained. Speed was held to minimum practical with outboard motor. On arrival at opposite shore the boat was turned about, and a return contour taken. Several runs were made using both the DR-17 and DR-19 recorders. Figure 3 is typical of bottom contours obtained.

Results of Skilak Tests

Although the waters of this lake are very milky due to the suspension of extremely fine glacial silt, excellent sonar conditions exist in the area of test. Horizontal ranges as recorded on the triplane target are near the full scale capability of the recorders. Since the small triplane represents a poor target when compared to "bottom" the results indicate no appreciable increase in attenuation of sound propagation in this type water.

Tests at Kenai River

Date: October 1, 1961

Location: Kenai River approximately one mile below Soldotna at Oberts Landing

Width: Approximately 200 feet

Depth: 8 feet maximum (refer to bottom contours Figure 4)

Bottom: Small rock, cobblestone and sand, rocks well rounded. Channel relatively smooth

Water: Opaque due to glacial milk. Surface shows evidence of considerable rolling (roily) although no white water. Current velocity approximately 6-7 feet/second.

Test 1. Horizontal Ranging on Triplane Target

Horizontal ranging on triplane proved to be impossible due to inability to hold triplane within transducer acoustic beam. Boat proved to be a relatively unstable platform in the turbulent river and

no means of steering or stabilizing transducer was available. Current also caused airfloat supporting anchored triplane to submerge. For this reason such tests were abandoned.

Test 2. Cross Stream Contours

Bottom contours were run using both the DR-17 and DR-19. Typical recordings are shown in Figure 4 and 5.

These figures are of particular interest since the depth contours of 4-1 and 5-2 are taken at a point wherein a rock or protrudence on the bottom causes white water to appear at surface. Figure 5-2 are DR-17 contours taken when passing through the most turbulent area. No apparent difficulty in obtaining a recording was encountered. Recording of Figure 4-2 and 4-3 are DR-19 recordings also taken while passing over and through the white water at surface. Note that some break up occurs at the turbulent area. This was apparently due to the shallow depth of transducer, thus allowing air to pass over the face of the transducer and destroying the coupling to water. When a re-run with the transducer lowered to a depth of one foot below surface was made, no difficulty was experienced. See Figure 4-3.

Results at Kenai River

Indications are that acoustic propagation is satisfactory in the Kenai. In spite of the high content of glacial silt making water opaque, and the rather severe turbulence, depth recordings were good. No unusual attenuation of transmission was noted. Gain control of both the DR-17 and DR-19 were maintained at near absolute minimum settings to avoid multiple echoes.

Tests at Russian River

Date: October 3, 1961

Location: Russian River at point of exit from Lower Russian Lake.
At site of counting tower

Width: 65 - 70 feet

Depth: Four feet (refer Figures 6-1)

Bottom: Sand and small pea gravel, relatively smooth. Bottom slopes somewhat symmetrically from maximum depth at center to a few inches at stream edges.

Water: Clear and smooth, current 3 feet/second, little visible turbulence

Tests - All tests made with DR-17 recorder (75KC)

Test 1. Bottom Contours

Bottom contours presented no problem. Gain setting was maintained at minimum setting to avoid double echoes. Contours as shown (see Figure 6-1) extend twenty feet from shore. This was maximum length of transducer cable. Recordings and results are considered to be excellent.

Test 2. Horizontal Ranging Tests

(a) The transducer was mounted at stream edge with beam in a horizontal plane. Water depth at this point was 24" and transducer depth 12". Figures 6-2 and 6-3 show results of bottom scatter at different gain settings. In Figure 6-3 the gain has been reduced such that only dominant targets are recorded.

(b) The transducer was next moved to a point seven feet off shore and positioned at a depth of 20 inches below surface. Water depth at this point was 30 inches. A triplane target was then submerged to a depth of 18 inches and slowly moved out to a range of 48 feet. Water depth was approximately $3\frac{1}{2}$ to 4 feet in depth. This shallow

depth permitted a man in waders to position the triplane.

Figure 7-1 is a recording of the triplane as it is moved out in range and finally fastened to a three inch diameter stake driven into stream bottom at a range of 48 feet. Note improvement in target echo after transducer was reoriented to bring target into center of beam.

Figure 7-2 shows resultant recording made as triplane is removed from stake and slowly walked to opposite bank of stream. It is interesting to note that in Figure 7-2 the stake with some moss or vegetation caught underwater about the stake is discernable after removal of the triplane target. Note also the presence of the stream bank after triplane was removed from water. Depth of water at opposite bank was approximately 10 inches in depth.

Test 3. Echo Ranging of Salmon

Several silver salmon were observed at the center of the stream. Using the DR-19 looking in a horizontal plane experimental ranging on a single salmon was attempted. Due to lack of acoustic power and receiver gain no returns or discernable echoes from this fish were noted. It should be pointed out the depth sounders as used are designed to record strong targets (the bottom) and extensive modifications would be expected for the application under consideration. Since it is of importance to know the relative target strength a single salmon represents, a fish was caught for further test.

The single salmon was suspended at various distances from the DR-19 transducer to determine the range and resolution of echoes from a single salmon. Figure 7-3 illustrates the result. The single salmon shows up at a distance of eight feet, (horizontal measurement). The apparent

random or intermittent echoes are due to the difficulty of maintaining the position of the salmon in the current. Because of these difficulties and the limitations of the DR-19 the results are considered to meet reasonable expectations.

Finally the salmon was carefully dressed in order to examine and record the physical dimensions of the air bladder. This air sack is of particular interest since it is probably the most significant source of acoustic reflection. The information was recorded for future use and acoustic simulation of a salmon.

Results at Russian River

As expected, back scatter from the bottom when looking horizontally shows up on the recordings. It is of importance to note that bottom echoes are relatively consistent and the predominant discontinuities show up as specific lines on the recording. Since the returns are not completely random in nature, the possibility exists that their presence may be tolerated or compensated for. A promising technique would be to utilize the doppler effect to differentiate between moving and stationary targets. Doppler shift of the echoes from moving salmon would result in two frequencies at the receiver input. These are:

1. The frequency of the returns from stationary objects at bottom and surface. (Backscatter and bottom reflections)
2. The frequency of the acoustic return from the moving salmon.

By signal processing it is possible to separate these two frequencies and reject the backscatter and bottom reflections and accept the salmon echoes for counting purposes.

Results of the horizontal ranging tests are considerably better than anticipated. Occasional loss of target as seen in Figure 7-1 is primarily due to triplane having been moved out of the transducer beams. The triplane used as a target has a relatively high target strength at the frequencies used in the test. The tests demonstrate conclusively that the transmission of acoustic energy in streams is practical and no apparent difficulty is evidenced by turbulence, entrained air or water borne noise. These results, of course, should not be interpreted to indicate that any point in the river would be satisfactory. They do indicate that the particular test site is good acoustically, and that other areas having similar physical characteristics will also be satisfactory.

ADDITIONAL INVESTIGATION AT BENDIX-PACIFIC

Simulated Targets

Utilizing the flotation bladder dimensions obtained from the Russian River silver salmon, calculations have been made of its target strength.

For further study and design purposes, several simulated targets have been made and tested under ideal conditions of deep water with resultant elimination of back scatter from bottom. Targets were made from vinyl tubing one inch in diameter and ten inches long representing the flotation bladder of a salmon. It is probable that an one inch sphere is also a fair representation of the target represented by a single salmon. A plastic float 3/4 inch in diameter (in lieu of one inch) has also been used as a representative target.

Tests At San Pedro Harbor

A Bendix depth indicator DI-16 operating at 200KC was slightly modified

by the addition of a test point in the receiver at a point prior to any limiting of received signals. This test point permits the use of an oscilloscope in examining the received signals for significant echoes.

Using this depth indicator, an oscilloscope, and the simulated targets, tests were run to determine actual ranges at which these targets were received. With the DI-16 and oscilloscope dockside, the target was slowly moved out in range. The 3/4 inch sphere was identified at ranges up to 45 feet. The larger targets were visible to 100 feet.

It should be pointed out that these results were obtained under a controlled test and in the absence of back scatter. However, the results do indicate that with relatively low acoustic power a single salmon can be detected under favorable conditions.

Additional data was taken at a fixed distance of 10 feet (measured accurately) such that actual target strength could be determined from known transmitting and receiving characteristics of the DI-16. Calculated and experimental values compare favorably. Measurements of target strength and field tests results are encouraging and indicate practical echo levels at reasonable ranges.

SYSTEM REQUIREMENTS

The design of an acoustical system for counting fish is an engineering problem. The principal problems to be encountered are acoustical in nature. For this reason many related problems must be considered and given serious consideration prior to and during design of any such system. Such problems and areas range from a consideration of the salmon and their habits, the geographic and geologic nature of the environment to the installation and operating conditions in the field.

Design of such a system is a development project requiring adequate field test and evaluation. Any design consideration should be limited to a system employing principles adaptable to various types of installations. It is understood that the objective shall be to measure or count the salmon escapement as far down stream as feasible. It is at these down stream points the rivers become large and attendant problems become more severe. Nevertheless a feasible compromise in location can be made for practical operation.

The survey indicates that for a practical field salmon counting equipment the design effort should be directed toward meeting the following general conditions:

1. The basic design shall be applicable to either large river or small stream applications.
2. Any requirement for weirs or submerged structures shall be limited to shallow water or near shore installations.
3. The equipment shall be capable of handling wide variations in fish concentration.

Data for the Russian River counting tower shows that the number of fish may vary from such low numbers as 1 to 4 per hour up to in excess of 100 per hour. Large rivers will probably exceed this by a factor of ten. This means a counting system must of necessity be able to count an occasional fish, remain quiescent and stable for long periods of low count and be free from transients or stray counts. At the other extreme the system must also be capable of counting at relatively high rates. Possibly on the order of 100 fish at each sample or acoustic ping sequence.

4. The electronic equipment shall be reliable and rugged for field use.
5. Equipment shall be designed such that personnel with limited electronic experience or knowledge can operate and maintain equipment in field.
6. Power requirements shall be relatively low such that battery operation will be feasible. Batteries may be charged at reasonable intervals by small portable generators.
7. As a final design consideration and problem it should be realized that each installation will have some minor unique characteristics determined by the acoustic environment at that particular installation.

CONCLUSIONS

Data taken during the survey has been of a qualitative nature. Results of acoustic tests have been such that definite conclusions can be made related to the proposed application of acoustic echo ranging. The conclusions herein are valid over limited ranges such as will be encountered in typical applications of a fish counting system. It is anticipated that these ranges should not exceed 100 yards.

Based on the data obtained at the various test sites it can be stated, that for practical purposes the attenuation coefficient or acoustic losses at selected sites are not significantly greater than normally encountered. Conclusions may be summarized as follows:

1. The fundamental acoustical propagation characteristics, of selected sites on typical rivers and lakes are satisfactory for acoustical echo ranging.

2. Reflections from surface and bottom will probably be the major source of problems in any development of echo ranging equipment for use as a salmon counting device. As discussed previously, techniques such as doppler enhancement will permit the acoustic detection of upstream migration and at the same time offer high rejection to such targets as bottom and surface reflections or other stationary targets. Using these principles the design of a practical system appears feasible.

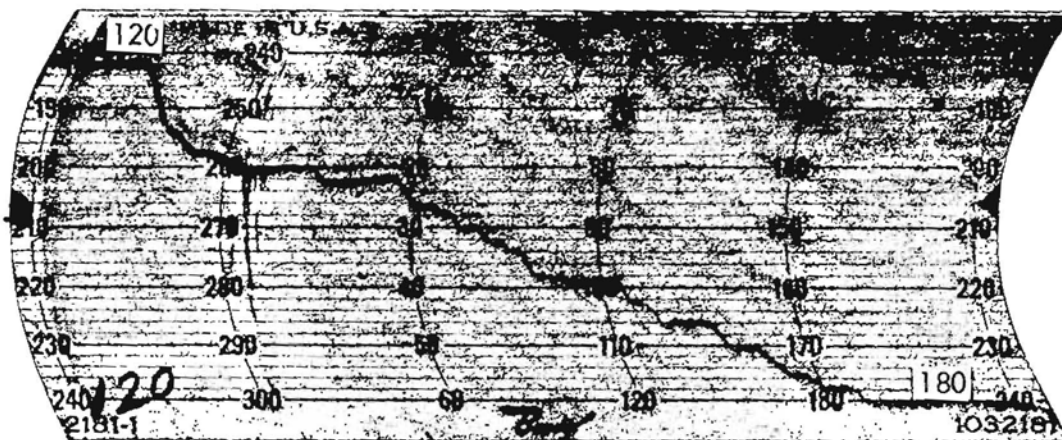
RECOMMENDATIONS

Based on the above conclusions it is recommended that a program be established for the development of an acoustical salmon counting equipment.

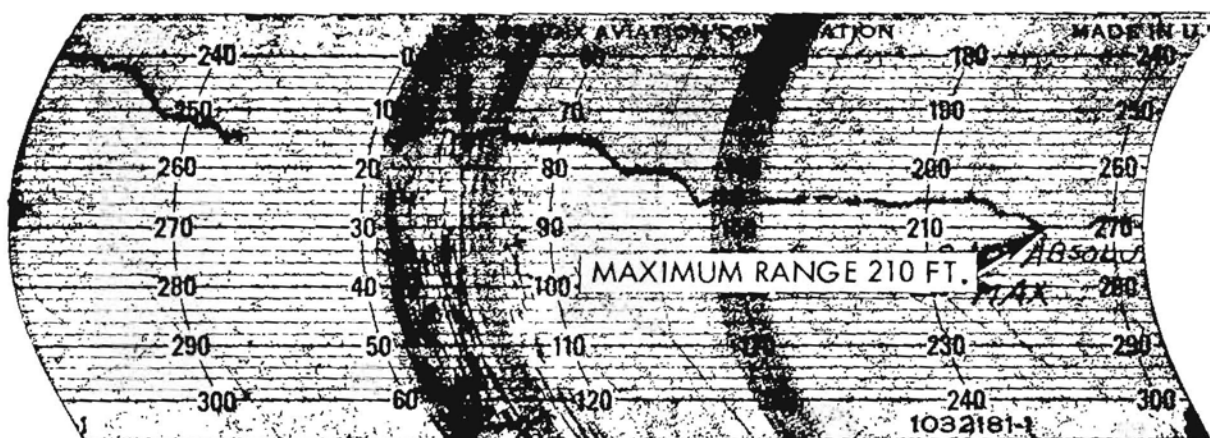
It is recommended that an equipment be designed specifically for operation at the Russian River counting tower. This is suggested for the following reasons:

1. Fish and Game personnel will normally be stationed at this location during periods of salmon migrations.
2. Visual and acoustic counts can be compared.
3. Location and characteristics have been surveyed and will be familiar to Bendix-Pacific engineers.

The initial system should be considered as an engineering unit thus making for economical construction and ease of making of design modifications if needed. Production design for reliability and service can be accomplished after acceptable performance of equipment has been demonstrated.



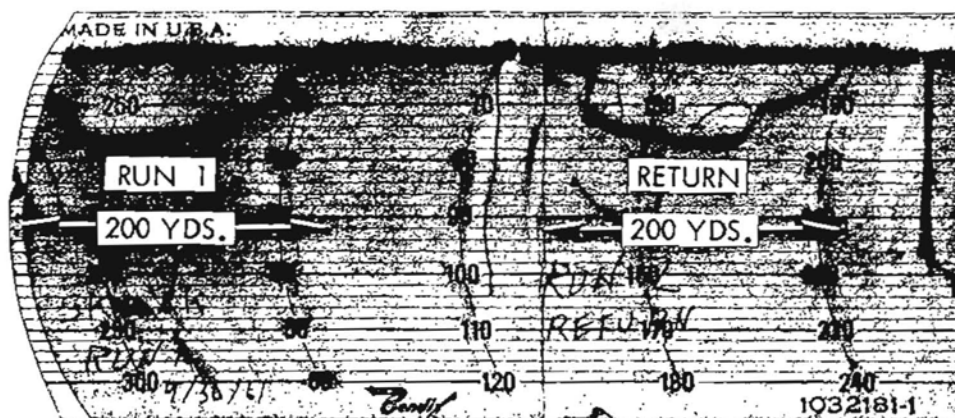
FULL SCALE 180 FEET



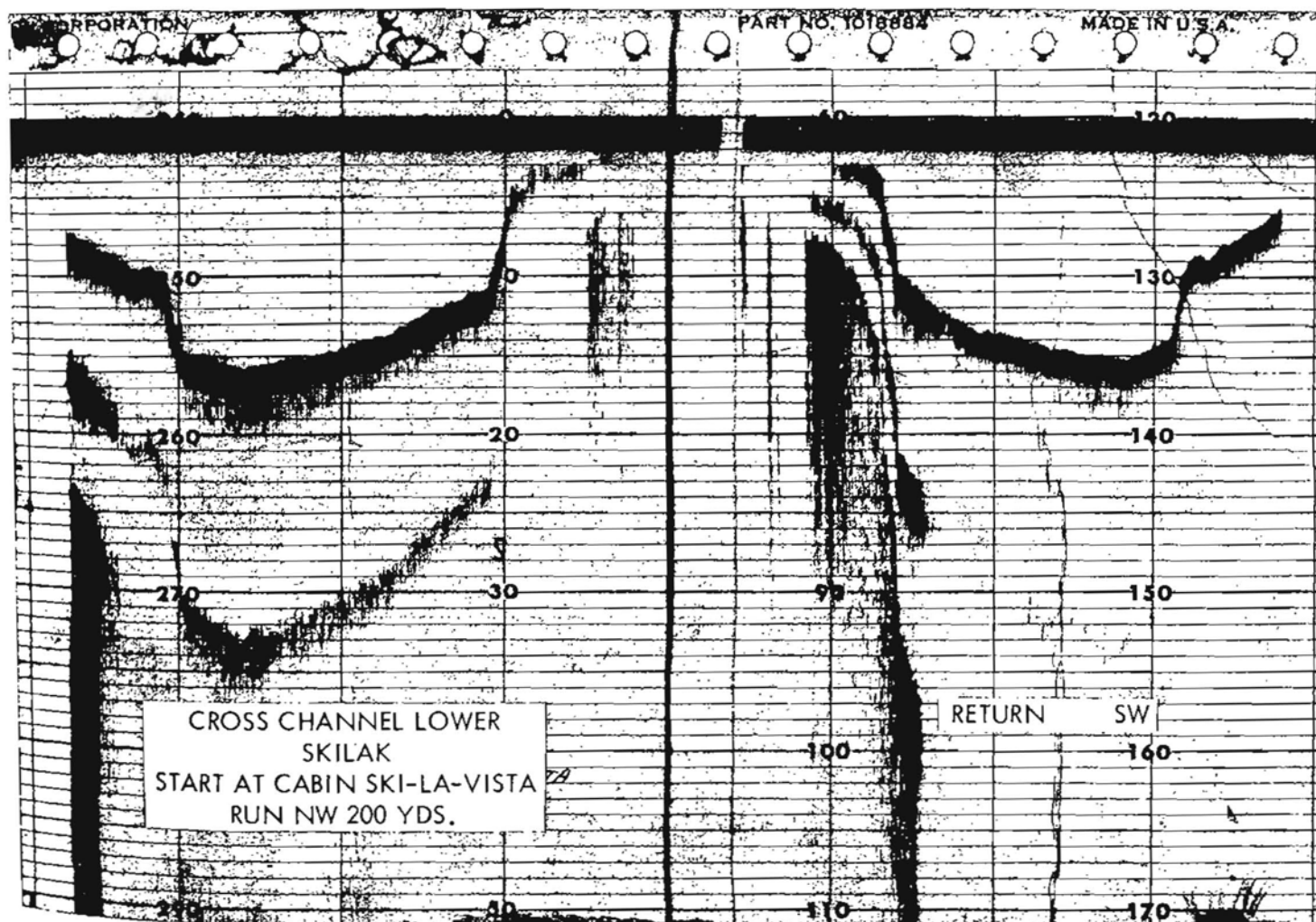
FULL SCALE 300 FEET

DR 19 RECORDINGS LAKE SKILAK SEPT. 30, 1961
 HORIZONTAL RANGING ON TRIPLANE TARGET
 WATER DEPTH 15 FT.
 TARGET DEPTH 7 FT.

FIGURE 2



DR 19 BOTTOM CONTOUR
LAKE SKILAK AT SKI-LA-VISTA
FULL SCALE 60 FEET



DR 17 BOTTOM CONTOUR
LAKE SKILAK AT SKI-LA-VISTA
FULL SCALE 60 FEET

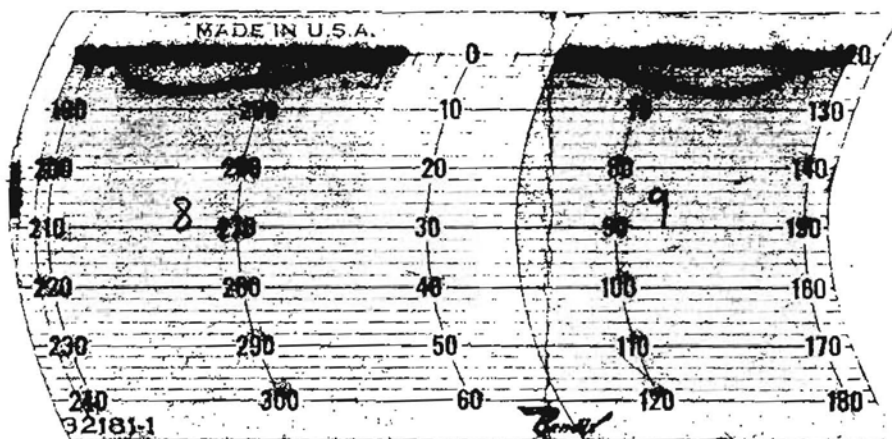


FIGURE 4-1

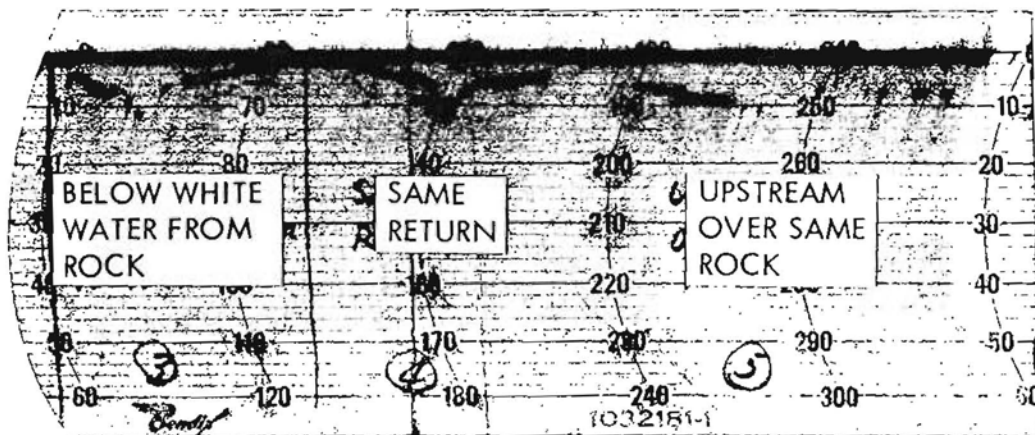


FIGURE 4-2

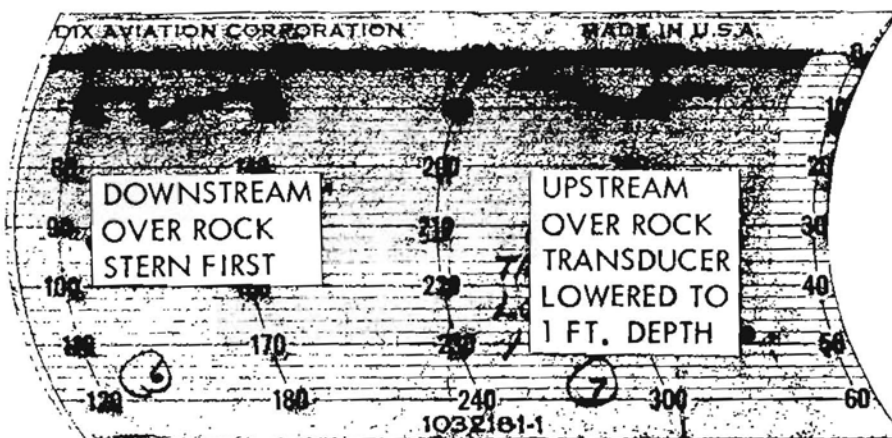


FIGURE 4-3

FULL SCALE 60 FEET (ALL FIGURES)

DR 19 RECORDINGS BOTTOM CONTOURS
KENAI RIVER
SOLDOTNA-OBERTS LANDING

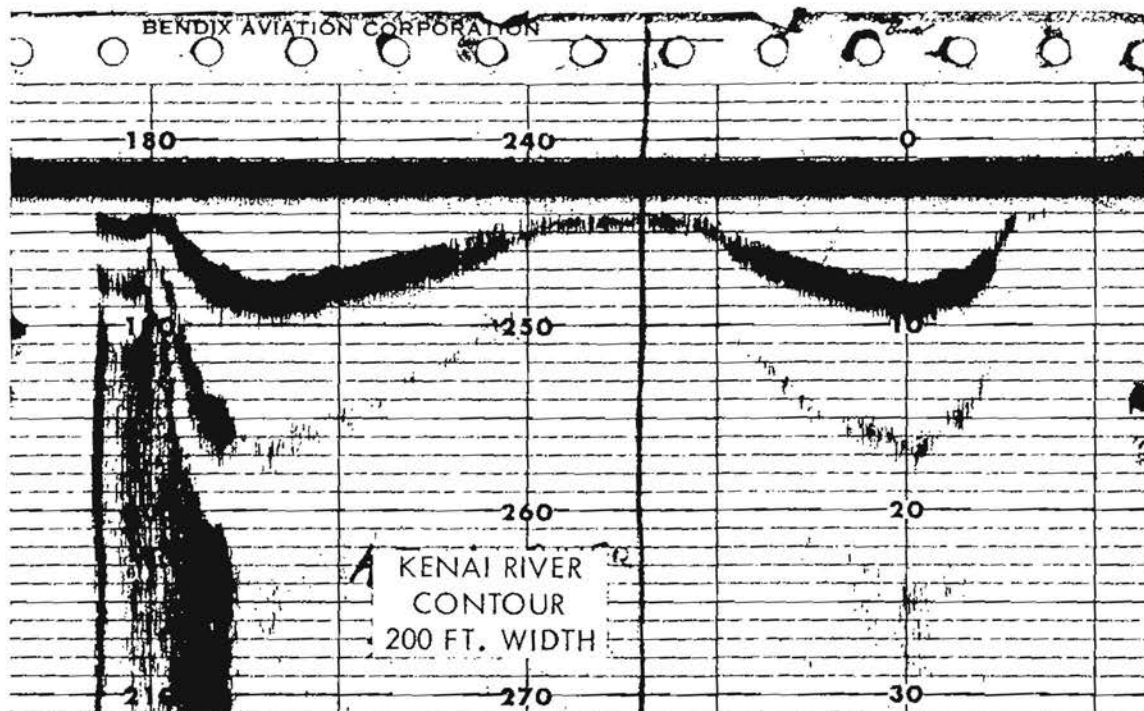


FIGURE 5-1

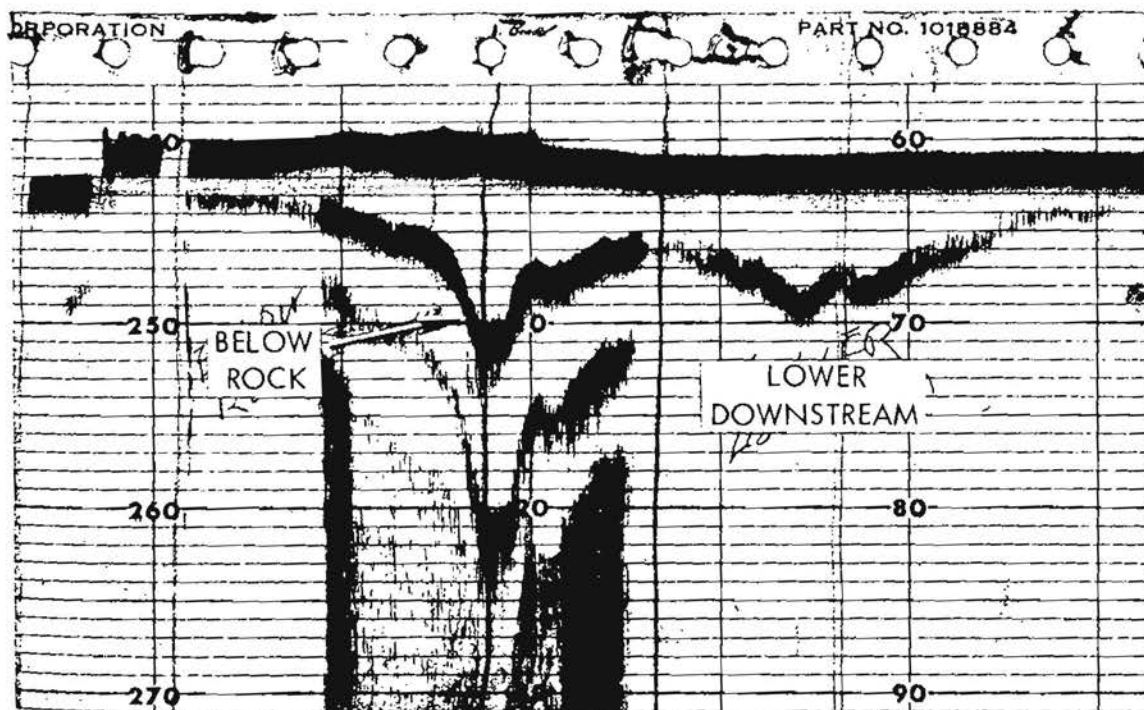


FIGURE 5-2

WATER ANCHOR LIT WITH 10 FEET
 DR 17 RIVER BOTTOM CONTOURS
 KENAI RIVER
 SOLDOTNA-OBERTS LANDING

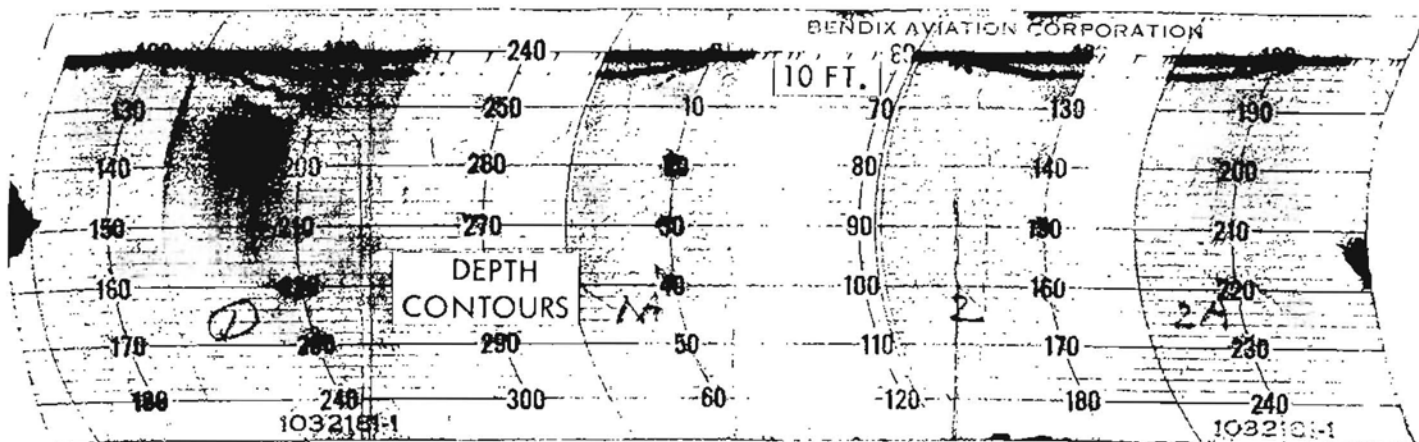


FIGURE 6-1

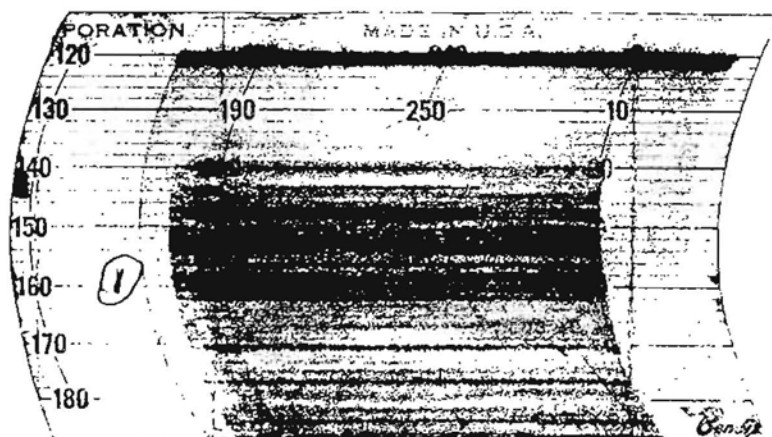


FIGURE 6-2

HORIZONTAL RANGING

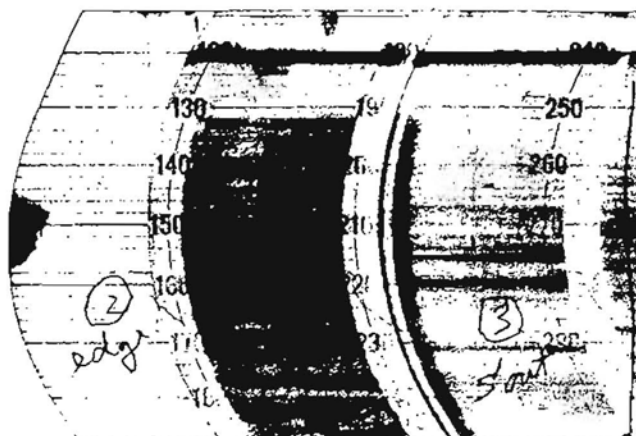


FIGURE 6-3

HORIZONTAL RANGING

DR 19 RECORDINGS
RUSSIAN RIVER AT COUNTING TOWER

FULL SCALE 60 FT. (ALL FIGURES)

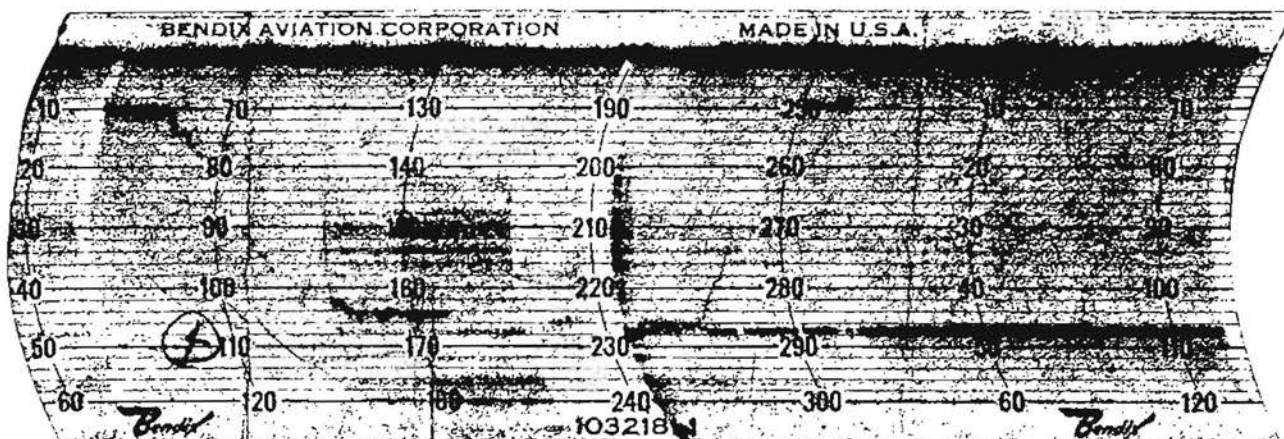


FIGURE 7-1
TRIPLANE HORIZONTAL RANGING

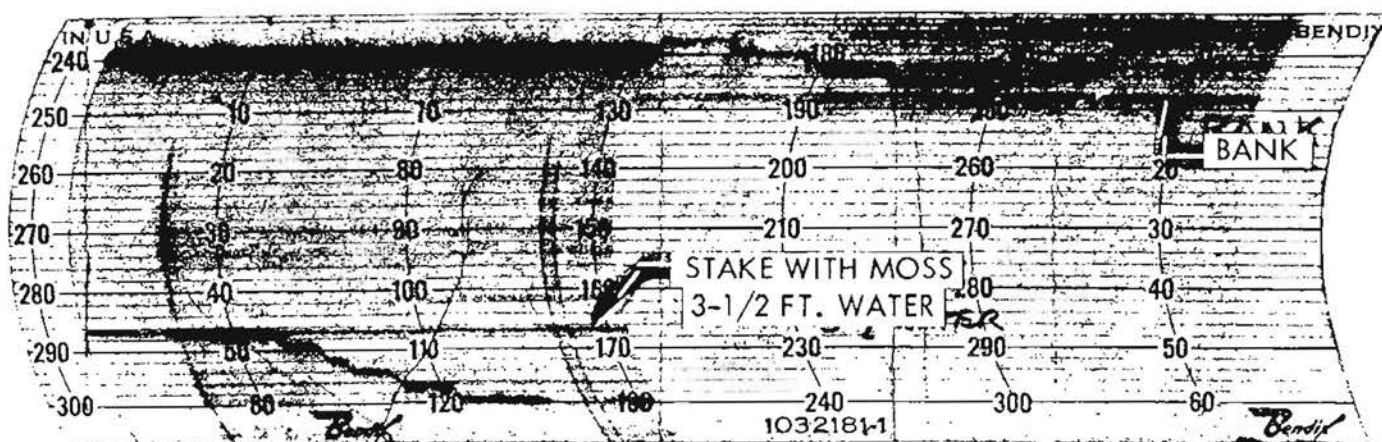


FIGURE 7-2
TRIPLANE HORIZONTAL RANGING

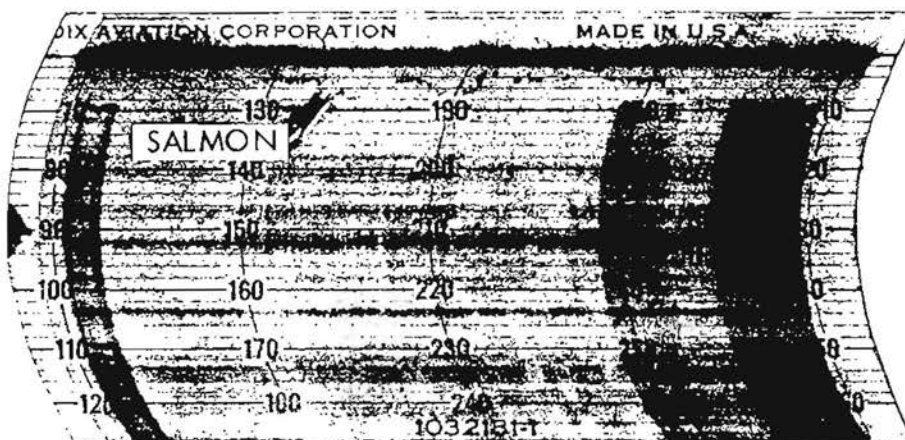


FIGURE 7-3
ECHO RANGE ON SINGLE SALMON

PROPOSAL FOR
AN ACOUSTIC SALMON COUNTING
SYSTEM

After the feasibility survey, Bendix Corporation prepared a proposal, with basic design for equipment for counting salmon by sonar. This proposal is presented in full on the following pages.

INTRODUCTION

The proposal presented herein is based on the "Feasibility Survey of Salmon Counting by Acoustic Means - Cook Inlet Alaska." The survey was made for the Alaska Department of Fish and Game, September 26 to October 6, 1961.

Results of the survey indicate that the fundamental acoustic propagation characteristics of selected sites on typical rivers and lakes are satisfactory for acoustical echo ranging. The apparent major source of problems will be acoustic reflections from the surface and bottom.

Sufficient engineering consideration has been given to the problem to arrive at a practical system concept. The proposed system shall be designed for operation at the Russian River counting tower and will provide:

1. A compact and portable system.
2. Automatic operation. May be unattended for extended periods.
3. A visual numerical read out of the statistical count.

BASIC SONAR REQUIREMENTS

As indicated by the acoustic survey, the basic design of the system should meet the following general conditions:

1. Basic design applicable to either large river or small stream application.
2. Any requirement for weirs or submerged structures shall be limited to shallow water or near shore installations.
3. The equipment shall be capable of handling wide variations in fish concentration.
4. Equipment shall be designed such that personnel with limited electronic experience or knowledge can operate and maintain

equipment in field.

5. Readily accessible adjustment shall be available to account for minor unique characteristics determined by the acoustic environment at a particular installation.

As indicated by test results of the acoustic survey at the Russian River and confirmed by tests at Bendix-Pacific, reflections from both the surface and bottom will be the major source of difficulty in development of an acoustic salmon counting device. Analysis of this problem indicates that the salmon's velocity (assume one knot or 1.6 ft/sec minimum) is adequate to permit the use of doppler enhancement signal processing techniques which will permit the acoustic detection of salmon migrating upstream and at the same time provide high rejection to:

1. Bottom reflection.
2. Surface reflection.
3. Stationary targets such as large rocks, or sticks protruding from bottom.
4. Surface debris floating downstream.

Although the design of the proposed system utilizes standard and well known techniques, the uniqueness of the application introduces many variables. For this and other reasons common to new equipment development programs, field test and evaluation is desirable to optimize performance and disclose unforeseen problems. The system as proposed is an engineering service test equipment, designed with flexibility and low cost as prime considerations.

PROPOSED SYSTEM

The system as proposed is designed to operate without the necessity for orifices or gates. It will also utilize insofar as practical, electronic

modules such as crystal oscillators, multivibrators and gates. These modules are commercial units of known characteristics and reliability. By use of these modules, engineering design time and lab tests are greatly reduced. The design is such that provisions are made for the following characteristics to be easily varied at installation:

1. Pulse length.
2. Keying repetition rate.
3. Power output.
4. Optional transducers narrow and medium beamwidth.

An engineering service test equipment, rather than a production prototype is proposed at this time. Reasons for proposing a service test equipment at this time are:

Design and fabrication of a practical salmon counting system compatible with use in natural or unrestricted streams is a development project. The first phase of this development should be devoted to establishing and field testing a system to establish firm design parameters and design. Any attempt at this time to produce a prototype meeting the physical and environmental requirements for equipment subjected to the intended use in the field by relatively unskilled electronic personnel, is premature and will result in additional cost.

The proposed system is comparatively straightforward. The system simplicity indicates that the cost of production units can be held to a reasonable value, costs being dependent on number of units involved.

TECHNICAL DISCUSSION

Certain basic assumptions have been made as design criteria and are

discussed in the following paragraphs.

1. Salmon velocity of a minimum of 1 knot and a maximum of 5 knots relative to bottom (ground speed) has been assumed as reasonable and practical.
2. Pulse length and other parameters are such that best resolution will be 1 foot. That is, salmon separated by a distance of 1 foot or more can be identified as separate units.
3. Maximum width of stream (or counting sector) 50 to 100 feet.
4. Keying rate or rate of sampling will be dependent on average salmon velocity across acoustic beamwidth. This may vary from 7.5 to 22.5 seconds dependent on beamwidth and salmon speed.

Figure 1 illustrates the typical installation of the counting system. The simple weir as shown is for the purpose of insuring that salmon will be restricted from moving so close to the acoustic source that they are out of the acoustic beam. Natural migration routes of the salmon may make this weir unnecessary. However, for purposes of evaluation it is presently considered desirable that this restraint on the salmon be included.

Acoustic Transmission

Figure 2 is a block diagram of the proposed electronic system and its operation is briefly discussed in the following paragraphs.

A key pulse generator having a repetition rate of 15 seconds (the actual period dependent on final installation at counting site) initiates the pulse length generator. This gates the 200 KC crystal oscillator "ON" and establishes a fixed pulse length of 400 microseconds. The 200 KC signal is

amplified by the power amplifier and drives the transducer. The transducer acoustically illuminates the stream with a beam approximately 20° in width and a vertical beamwidth of 45° for a period of 400 microseconds. During this transmission period the receiver is disabled so extraneous counts will not be generated.

Signal Processing

At the conclusion of the acoustic transmission, echoes from various sources are received at the transducer. The predominant echoes both in number and intensity will be due to reflection from the bottom and surface of the stream and other stationary objects. These echoes will be at the exact frequency of the transmitted signal, namely 200 KC. Echoes from the salmon although considerably weaker will be slightly displaced in frequency.

Received signals from the transducer are amplified by the receiver section for further signal processing. The receiver sensitivity or gain is automatically controlled as a function of time (T.V.G. time varied gain) following the conclusion of the transmitted pulse. Echoes occurring at short range or short time are of higher intensity. Reduction of receiver sensitivity in respect to time greatly reduces the dynamic range over which the signal processing must operate.

A bandpass filter within the receiver greatly attenuates signals from stationary targets at 200 KC while permitting signals having a small "up doppler" frequency shift to pass with little loss. Bandpass of the receiver is 200.070 KC to 200.70 KC.

Output of the receiver is mixed with a 190 KC signal. The resultant difference products will be signals of 10.070 to 10.7 KC. An additional 10 KC bandpass filter is used to further attenuate all signals lying outside

the 10.070 and 10.70 KC regions. It should be noted that only targets moving upstream at a ground speed of 1 to 5 knots will produce an echo falling within the prescribed bandpass.

The leading edge of the resultant target envelope of 400 microseconds is used to trigger a 800 microsecond pulse generator, whose output is one of two required inputs to an "AND" gate. The rectified target envelope is delayed sufficiently to eliminate random noise spikes and squared by the squaring circuit. The following envelope detector generates a pulse at the leading and trailing edge of the target envelope. The leading edge pulse triggers a bi-stable multivibrator whose resultant output is the second of the two required inputs to the "AND" gate, thereby opening the gate and introducing a single count or pulse to the electronic counter. The electronic counter will provide a visual indication of the total count over any desired period.

The "AND" gate and secondary gating pulses from the delayed output of the fullwave detector provide a positive means of preventing random noise within the bandpass from keying the electronic counter. It should be noted that two simultaneous inputs are required at the "AND" gate to generate an output pulse.

POWER REQUIREMENTS

All circuitry will be transistorized with the exception of the electronic counter. This counter will be a standard laboratory electronic counter operating from 115V 60 cycles AC. For this reason a small AC to DC power supply will be provided to supply the balance of the circuitry. A small portable gasoline generator will then supply all necessary power and eliminate the need for both batteries and an AC generator.

INSTALLATION

It is recommended that the initial installation and evaluation be made at the Russian River counting tower located at the outlet of lower Russian Lake.

Measurements and observations indicate this location to have numerous advantages for the field test evaluation program. Acoustic conditions are good and the nature of the stream bed makes installation simple. In addition, the presence of the counting tower and attendant personnel will provide necessary support for visual count and calibration of the electronic counting system.

Reference to Figure 2 indicates the proposed installation. The electronic equipment is to be located in some relatively simple water-proof structure to shield from rain and storm. The transducer is mounted approximately 8 or 9 feet off shore such that it lies at least one foot below surface and tilted slightly so that the beam grazes the surface and strikes the bottom close in at about a 5 foot distance. The simple weir may be large mesh wire. The purpose of this weir is to insure the salmon will pass through the acoustic illuminated area. The transducer will be mounted upstream from the weir by approximately two feet or sufficient distance that it will not cause shadows in the 20° horizontal beam.

Keying or pulse rate will be at approximately 15 second intervals or at such a rate each salmon is counted but once as it migrates through the beam.

If a second installation is desired, it is recommended that it await the completion of satisfactory tests and evaluation of system at Russian River. At conclusion of a satisfactory evaluation at Russian River, the

system may easily be moved to Skilak and adapted to use there.

SUMMARY

The proposed system and installation is considered to be the most straight forward and practical means to further the development of an acoustic counting system. It will provide for maximum flexibility, ease of installation and practical evaluation.

ELECTRONICS

TRANSDUCER

UP
STREAM
↑

20° APPROX

9' APPROX

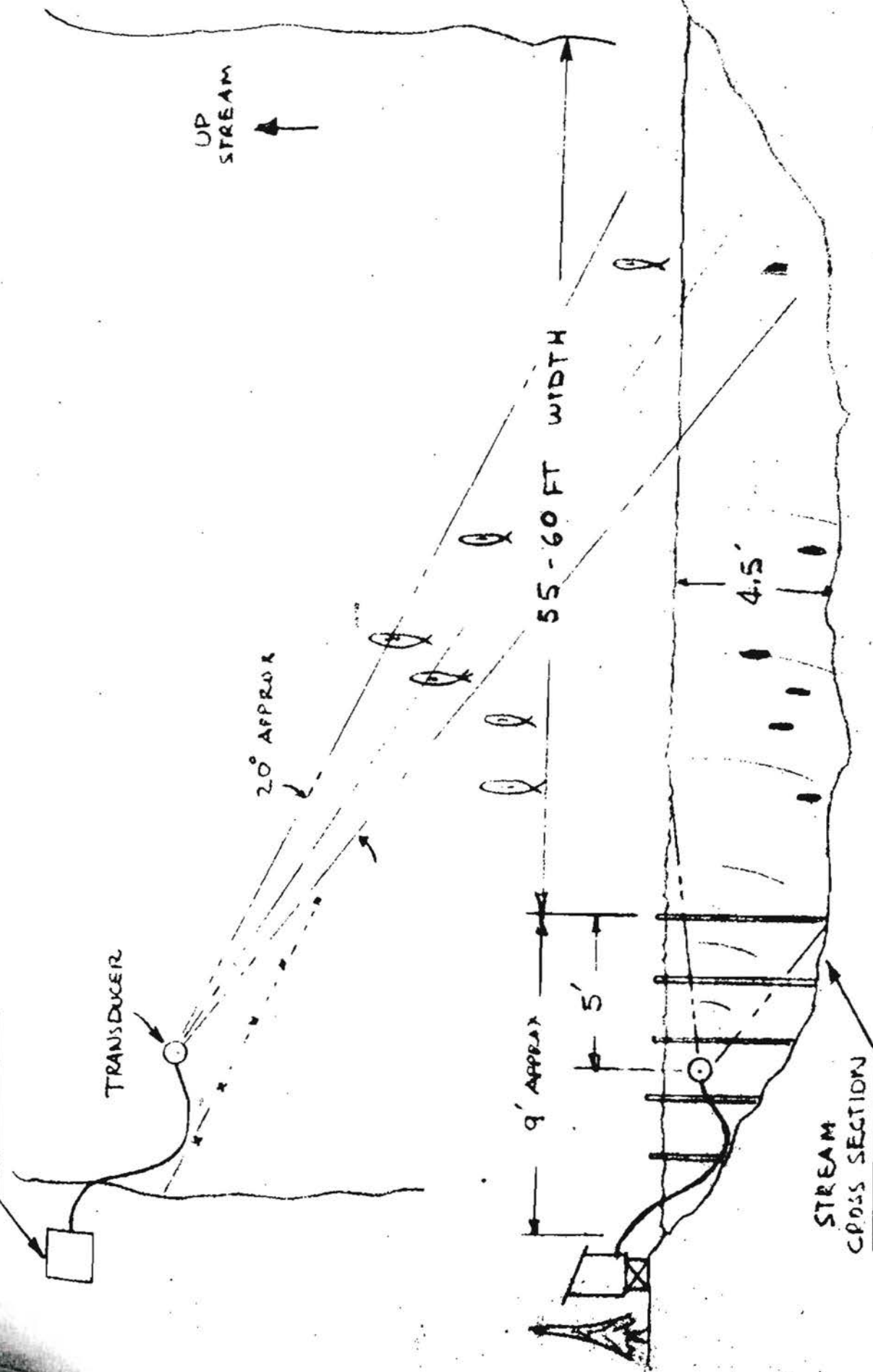
5'

55-60 FT WIDTH

STREAM
CROSS SECTION

4.5'

FIGURE 1
INSTALLATION
ACOUSTIC COUNTING SYSTEM
MISSISSIPPI RIVER COUNTING TOWER



HERRING

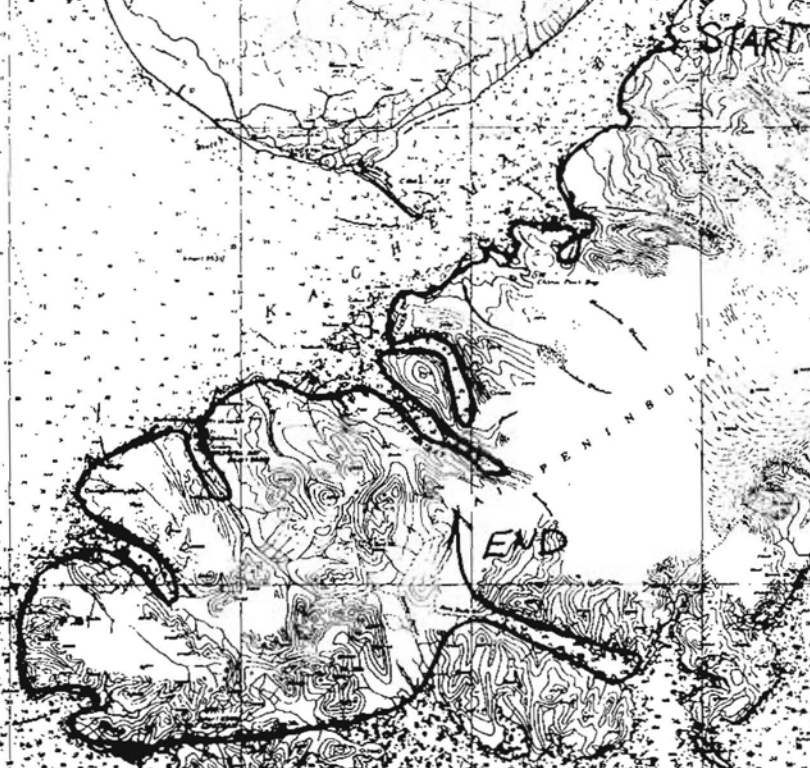
The U. S. Fish and Wildlife Service started annual herring surveys in Cook Inlet and elsewhere in Alaska. At one time Kachemak Bay was important in herring production, with extremely heavy concentrations of this species. No fishery exists now for herring, save for a few personal use gill nets that are put out. Some interest is indicated from time to time by individuals who want to catch and sell herring for bait, but for the past two years no individual has attempted to follow through on this.

Herring are seen sporadically throughout the spring and summer months in all clear water areas of the Inlet.

One flight was made expressly to seek spawning herring, as was done in 1960 (see the 1960 Annual Report for Cook Inlet). Data gathered may be found following this page.

May 19, 1961. Flight made in Super Cub, Klingbeil as pilot, Bearden observer. Left Bear Cove at 0620. Tide 2-3 hours after high. Clear & calm, flew at 700 feet. Visibility good to excellent. Gulls concentrated on flat east of Mallard Bay. Scoters concentrated off south of Mallard Bay. Gulls (590-75) at Glacier Spit. Two herring nets (gill) out in Halibut Cove, with fish in one. One whale seen Sadie Cove. Seals 47 in Utka Bay, bear head, at Island; 4 in Halibut Cove Lagoon. Some herring milt in water in Jakaloff Bay. Gulls in ~~some number~~ in Portlock. New logging operation at Rocky Bay.

0618 ran into rain at Port Dick, poor visibility. Stopped survey.



STREAM CLEARANCE - COOK INLET

As usual a crew was assigned the responsibility of clearing beaver dams from spawning areas in the Susitna Basin and on the Kenai Peninsula. Work this year continued for about six weeks, with most of the problem areas in the Susitna area being covered.

A recommendation by the crew this year was that instead of blowing dams as they are found, dams should be located in a preliminary survey, and then only when salmon are running in the drainages concerned, should the dams be blown. More efficiency should result from this method, though the flying time involved may be greater.

Also instead of using collapsible boats, it was found that some pilots were willing to lash a 15-foot aluminum sports boat to the floats of a Cessna 180 and fly it into the areas where work was needed. This is much more satisfactory than trying to transport two men, their camp gear and dynamite in a collapsible rubber or canvas boat. Most such boats are not very seaworthy, they puncture easily, and they definitely do not have a capacity for a large load. Two men, dynamite, outboard, gasoline, and camp gear, with grub, bring the weight total to at least 1,000 pounds.

One operation during 1961 was particularly satisfying. A small lake at Anderson Beach, in the outer district, has a run of red salmon. These fish are susceptible to poaching, for they are near the boundary to the southern district, which opens some time before the outer district. A school of several hundred reds were blocked from reaching the lake they spawn in when they were discovered in mid-June. A crew was flown to the area with powder and tools, and within hours they had the lake outlet cleared of the driftwood debris that

was blocking it. Even as they completed the clearance job the entire school of salmon swam past them into the lake.

The stream clearance work in Cook Inlet has been reported on at length in the 1960 Annual Report. This brief resume' of 1961 work in no way is intended to suggest that less work was done this year. On the contrary, the program was even more thorough than during the 1960 season.

COOK INLET SALMON COUNTING STATIONS

Two counting stations were successfully operated in 1961. The Russian Lake station for the second year yielded what is believed to be an accurate count. This count, however, reflects the Russian system run, and indications are, it does not give a good index to the Kenai River system run of red salmon.

This conclusion is based on the low count for 1961 as compared to 1960 (37,680 for 1960, 22,814 for 1961), and the fact the indications were that the Kenai escapement for 1961 was actually stronger in 1961 than for the former year. Aerial observations made by Commercial Fisheries personnel and observations made by Sports Fish Division biologists were that the 1961 run of reds piled up in Skilak Lake and remained there for some time, and then distributed themselves in great numbers in the Kenai River between Skilak and Kenai Lakes.

The Fish Creek count for 1961 was poor. Indications are that it reflected the sub-normal red escapement for the entire Susitna Basin.

FISH CREEK RED SALMON ESCAPEMENTS

1938 THROUGH 1961

<u>YEAR</u>	<u>RED SALMON COUNT</u>
1938	182,463
1939	116,558
1940	305,982
1941	55,077
1942	
1943	
1944	
1945	
1946 *	57,000
1947 *	150,000
1948 *	150,000
1949	68,240
1950	29,659
1951	34,704
1952	92,724
1953	54,345
1954	23,287
1955	37,445
1956 **	42,663
1957	15,630
1958 ***	26,000
1959 ****	77,416
1960	90,720
1961	36,002

- * Estimated escapement - no weir installed
- ** Estimated escapement - weir washed out
- *** Estimated escapement - high water condition
- **** Estimated escapement - initial year or screen-count sampling method

RUSSIAN RIVER RED SALMON ESCAPEMENTS

1960 THROUGH 1961

<u>YEAR</u>	<u>RED SALMON COUNT</u>
1960	37,680
1961	22,814

An unusual feature of the 1961 Fish Creek count was the high percentage of jack salmon. During 1960 not over one percent of the run was composed of jacks.

During 1961, 20.16 percent of the total count was composed of jack salmon. (1,439 of 7,135 fish actually counted as a sample.)

Deshka River, Susitna Basin:

The need for an index counting station in the Susitna Basin has long existed. During the 1960 season a crew was sent into the area with a Turbo-craft shallow draft boat to locate, if possible, a stream that would give a satisfactory index to escapement into the Susitna River system.

The Deshka appeared to be a good possibility. At the time it was first viewed it was low and reasonably clear. All five species of salmon run in it. There are a number of red salmon spawning lakes at its headwaters. The river was reasonably close to Anchorage and to the mouth of the Susitna.

Accordingly an attempt was made to establish a counting station there in May, with hopes of realizing a king count early in the season, and a red salmon count later.

When the counting tower was established the Deshka was low and clear. Kings were running, and fish could be seen. Soon afterward heavy rains brought the river up over four feet and it became murky. It remained murky and fluctuated markedly during the rest of the season. By the end of June all attempts to use the Deshka as a counting station were abandoned, however the cabin that was loaned to the Department there proved to be an ideal headquarters from which to make aerial surveys of the entire Susitna Basin. Twice

each week through July flights were made to known red salmon spawning areas in clear water tributaries of the Susitna.

The Dashka obviously will never be suitable for a counting tower site. Another site is to be attempted in 1962, probably in the Talachulitna system.

English Bay:

An attempt to get the stream guard at English Bay to continue the counts started in 1960 met with doubtful success. Escapement into this system can be termed "moderate" for 1961, but an estimate of numbers is impossible.

TEMPORARY EMPLOYEES

During the year 11 different individuals were hired in the Cook Inlet area for various assignments as follows:

<u>Name</u>	<u>Dates of Employ</u>	<u>Assignment</u>
Rae Baxter	June 18 to Oct. 20	Baxter and his wife, Sera, were assigned to survey salmon streams on the west side of Cook Inlet from Chuit River to below Snug Harbor. Both of these individuals hold fisheries degrees.
Sera Baxter	June 19 to Sept. 1	See above.
Floyd Fortuin	June 24 to Aug. 31	Second year in Cook Inlet. Worked in Susitna Basin . . making aerial counts of red salmon check points twice a week, attempting to operate the Dashka counting tower, and lastly, cooperating with the Sports Fish Division in a king salmon survey.
Eric J. Francke	June 13 to Sept. 8	Third year man in Cook Inlet. In charge of beaver dam removal. Helped make stream surveys after beaver dam removal work.

<u>Name</u>	<u>Dates of Employ</u>	<u>Assignment</u>
Robert H. Moss	April 18 to May 25	Biologists-observer for offshore seismic operation.
Michael L. Nelson	June 7 to Sept. 5	Counting tower duties, helped with organizing Fritz Creek transfer. Stream surveys. General duties.
Myrtle S. Nickel	March 27 to Sept. 31	Clerk-Typist, weekly pack reports, fish ticket coding, licenses and clerical help.
Julius Reynolds	May 23 to Sept. 12	Counting tower Dashka River, assisted beaver dam removal, stream surveys.
Lawrence Spacone	June 30 to Sept. 31	Russian River counting tower. Helped with Fritz Creek transplant.
Madeleine Waterman	Sept. 18 to 30	Clerk-Typist II. Report typing.
William Wilttrout	June 1 to Aug. 2	Cook Inlet's representative for combined commercial fisheries-sport fish king salmon study, Susitna River.

May 3, 1961

FIELD ANNOUNCEMENT

Justification:

1. Commercial quantities of herring are now present in the northern portion of Resurrection Bay.
2. An economic need exists for these herring.
3. Department personnel will sample each catch for the protection of migrating salmon smolts.

Now therefore the following emergency regulation is adopted:

Section 109.53 shall be amended to read:

Closed waters, herring.

Fishing for herring is prohibited prior to October 1 in all waters closed throughout the year to salmon fishing with the exception; that the commercial taking of herring is allowed in Resurrection Bay, north of a line from the southeast corner of the Alaska Railroad dock to the southwest corner of the Alaska Freight Line dock.

This regulation shall become effective at 8:00 a.m., May 6, 1961, and it will remain in effect until closed by field announcement.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Commercial Fisheries Division

cc: C. L. Anderson
Walter Kirkness
C. H. Meacham
Ben L. Hilliker
Richard Haley
Chuck Wilson
Halibut Producers Cooperative
U. S. Post Office, Seward

May 9, 1961

FIELD ANNOUNCEMENT

Justification:

1. A need for food exists in the native villages of English Bay and Port Graham.
2. The natives of English Bay and Port Graham have traditionally depended upon salmon for food.
3. It is desirable for management purposes to learn through sample fishing the magnitude of the king salmon run in the Port Graham-English Bay area.

Now therefore the following emergency regulation is adopted:

Section 109.92 (c) (1) shall be amended to read:

(1) Between Dangerous Cape and the point south of English Bay at 151° 57' 29" W. long., subsistence fishing shall be allowed from 6:00 a.m. Tuesday until 6:00 a.m. Wednesday and from 6:00 a.m. Friday until 6:00 a.m. Saturday of each week, commencing May 16 and continuing only until commercial fishing season for salmon is opened in the Southern district by field announcement, after which the original published regulations shall apply.

ALASKA DEPARTMENT OF FISH AND GAME

C. L. Anderson, Commissioner

cc: Walter Kirkness
C. H. Meacham
Frank Stefanich
Don Roberts
Ben Hilliker
Richard Haley
Chuck Wilson
E. B. Martin
U. S. Post Office, Port Graham
U. S. Post Office, English Bay

May 9, 1961

FIELD ANNOUNCEMENT

Justification:

1. A need for food exists in the native village of Tyonek.
2. The natives of Tyonek have traditionally depended upon salmon for food.
3. It is desirable for management purposes to learn through sample fishing the magnitude of the king salmon run in Cook Inlet adjacent to the Moquawkie Indian Reservation.

Now therefore the following emergency regulation is adopted:

Section 109.92 (a) (2) shall be amended to read:

(2) In the waters of Cook Inlet immediately adjacent to the Moquawkie Indian Reservation subsistence fishing will be allowed from 6:00 a.m. Monday until 6:00 a.m. Tuesday and from 6:00 a.m. Thursday until 6:00 a.m. Friday of each week, commencing May 15 and continuing only until commercial fishing season for salmon opens June 8, after which the original published regulations shall apply.

ALASKA DEPARTMENT OF FISH AND GAME

C. L. Anderson, Commissioner

cc: Walter Kirkness
C. H. Mascham
Frank Stefanich
Don Roberts
Ben Hilliker
Richard Haley
Chuck Wilson
E. B. Martin
U. S. Post Office, Tyonek

May 16, 1961

F I E L D A N N O U N C E M E N T

Justification:

1. This regulation has not been enforced in previous years and new mesh sized nets have come into common usage with no detrimental effect to the fishery.
2. Continuation of this regulation will cause an economic hardship to the fishermen.

Now therefore the following emergency regulation is adopted:

Section 109.15 Size of hand purse and beach seines, shall be amended to read:

Hand purse seines and beach seines shall be not less than 90 fathoms in length and 100 meshes in depth.

This regulation shall become effective at 8:00 a.m. June 1, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. L. Anderson, Commissioner

cc: Walter Kirkness, Director
C. H. Mascham, Regional Supervisor
C. A. Weberg, Area Mgmt. Biologist
Ben Hilliker, Mgmt. Biologist
Seward Office
Anchorage Protection Office
U. S. Post Office, Seldovia
U. S. Post Office, Seward
U. S. Post Office, Kenai
U. S. Post Office, Ninilchik

May 25, 1961

FIELD ANNOUNCEMENT

Justification:

1. Commercial quantities of herring are no longer present in the northern portion of Resurrection Bay.
2. Adult red salmon are now starting to school in this portion of the bay.

Now therefore the following emergency regulation is adopted:

Section 109.53 shall be amended to read:

Closed waters, herring.

Fishing for herring is prohibited prior to October 1 in all waters closed throughout the year to salmon fishing.

This regulation shall become effective at 12:01 a.m., May 31, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weborg
Area Management Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walt Kirkness
C. H. Mescham
Ben L. Hilliker
Richard Haley
R. Charles Wilson
Halibut Producers Co-op., Seward
U. S. Post Office, Seward

June 2, 1961

F I E L D A N N O U N C E M E N T

Justification:

1. The recent need for food in the native village of Tyonek has been satisfied in that king salmon have been caught for subsistence use since May 15.
2. A satisfactory sample of the king salmon run on the west side of Upper Cook Inlet has been obtained through subsistence fishing at the village of Tyonek.

Now therefore the following emergency regulation is adopted:

Section 109.92 (a) (2) shall be amended to read:

(a) Northern district.

(2) In the waters of Cook Inlet immediately adjacent to the Moquawkie Indian Reservation, in conformance with commercial seasons, open weekly periods, and commercial gear specifications.

This regulation shall become effective at 6:00 a.m., June 2, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg
Area Management Biologist
Cook Inlet Area Office
Homer, Alaska

cc: Walter Kirkness, Director, Commercial Fisheries Division
C. H. Meacham, Regional Supervisor
Don Roberts, Protection Officer
U. S. Post Office, Tyonek

June 6, 1961

F I E L D A N N O U N C E M E N T

Justification:

1. Some salmon escapement has been achieved in the Southern District as of this date.
2. Salmon have appeared in several areas of the Southern District in sufficient numbers for harvest.

Now therefore the following emergency regulation is adopted:

Section 109.05 (b) shall be amended to read:

(b) Southern District.

From June 8 until closed by field announcement.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben L. Hilliker
Ed Martin
Howard Marks
U. S. Post Office, Seldovia
U. S. Post Office, Homer

June 27, 1961

FIELD ANNOUNCEMENT

Justification:

There is considerable confusion regarding the proper method of measuring of king crab.

Now therefore the following emergency regulation is adopted:

Section 109.71 Minimum size of male crabs, shall read:

No king crab shall be less than 6 1/2 inches in greatest width of shell. This measurement shall be at exact right angles to the length on the widest part of the carapace (or shell) and shall include the spines.

This regulation shall become effective 6:00 a.m., June 28, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walt Kirkness
C. H. Mescham
Roy Rickay
E. B. Martin
Ben L. Hilliker
Howard Marks, M/V Auklet
Don Roberts

Processors

Halibut Producers, Seward
Wakefield Fisheries, Seldovia
Ursin's Seafoods, Seldovia
E. V. Browning, Homer
Martin Goresen, Seward
Ralph Grosvold, Seldovia
A. Hennessy, Anchorage
Kachemak Bay Packing Co., Homer
Lee Shelford, Homer
Charles Simon, Kaslof
Sutterlin & Wendt, Seldovia

U. S. Post Offices

Seldovia
Homer
Seward

June 27, 1961

FIELD ANNOUNCEMENT

Justification:

Clarification.

Now therefore the following emergency regulation is adopted:

Section 109.21 Closed waters, (k) shall read:

(k) In all other salmon streams within 500 yards from the terminus or as posted.

This regulation shall become effective 6:00 a.m., June 28, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Moacham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts

Canneries
Kenai Packers, Kenai
Emard Packing Co., Anchorage
Seldovia-Port Graham Consolidation, Seldovia
Columbia-Ward Fisheries, Kenai

U. S. Post Offices
Kenai
Seldovia
Homer

July 3, 1961

FIELD ANNOUNCEMENT

Justification:

Section 109.05 Open fishing seasons, salmon.

(d) Outer district. To be opened and closed by field announcement.

Certain portions of the Outer district now contain fish in sufficient numbers to warrant a fishery.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing seasons, salmon.

(d) shall be amended to read:

(d) Outer district

(1) All waters east of and including Port Dick to the boundary of the Eastern district at 149° 30' W. long., from 6:00 a.m. July 6, 1961 until closed by field announcement.

(2) All waters west of the entrance of Port Dick to the boundary of the Southern district at Point Adam will remain closed until opened by field announcement.

This regulation shall become effective 6:00 a.m., July 6, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mascham
Ben L. Hilliker
S. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts

Canneries
Seldovia-Port Graham Consolidation, Seldovia
Axel Urwin, Seldovia

U. S. Post Offices
Kenai
Seldovia
Homer
Seward

July 10, 1961

FIELD ANNOUNCEMENT

Justification:

Inclement weather has greatly reduced the fishing effort in the North Central and South Central districts during the periods July 6-7 and July 10-11.

A fair showing of fish is present in these districts and escapement is proceeding satisfactorily.

Now therefore the following emergency regulation is adopted:

Section 109.06 Weekly fishing periods, shall be amended to read:

The periods open to commercial fishing are as follows:

(a) In the Northern district from 6:00 a.m. Monday until 6:00 a.m. Tuesday and from 6:00 a.m. Thursday until 6:00 a.m. Friday. North Central and South Central districts from 6:00 a.m. Monday, July 10, until 12:00 noon Tuesday, July 11, 1961.

Effective 12:01 p.m. July 11, 1961 fishing periods in these districts will be as set forth in Section 109.06 (a).

This regulation shall become effective 9:00 p.m., July 10, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mascham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts

July 15, 1961

FIELD ANNOUNCEMENT

Justification:

Certain streams in the Outer district have not received adequate escapement.

The fishery has harvested a number of fish in areas and bays where fish were present in commercial quantities.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon:

(d) Outer district, shall be amended to read:

(d) Outer district

Closed until opened by field announcement.

This regulation shall become effective 2:00 p.m., July 15, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, IMFFC

Canneries
Seldovia-Port Graham Consolidation
Axel Ursin, Seldovia

U. S. Post Offices
Seldovia
Seward
Homer
Kenai

July 15, 1961

FIELD ANNOUNCEMENT

Justification:

109.05 Open fishing seasons, salmon.

(c) Kamishak Bay district.

To be opened and closed by field announcement.

Key streams in the Kamishak Bay district are now receiving adequate escapement.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing seasons, salmon.

(c) Kamishak Bay district shall be amended to read:

(c) Kamishak Bay district.

From 6:00 a.m. Monday, July 17, 1961, until closed by field announcement.

This regulation shall become effective 2:00 p.m., July 15, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Axel Ursin, Seldovia
Kenai Packers
Emard Packing Co.
Columbia-Wards
Snug Harbor Packing Co.

U. S. Post Offices
Homer
Seward
Seldovia
Kenai

July 15, 1961

FIELD ANNOUNCEMENT

Justification:

Certain streams and bays in the Southern district have not received adequate escapement.

Now therefore the following emergency regulation is adopted:

Section 109.05 (b) shall be amended to read:

(b) Southern district

From June 8 until closed by field announcement, except that the following areas will be closed to salmon fishing until further notice:

1. Sadie Cove.
2. That portion of Tutka Bay southeast of a line extending from the stream guard cabin northeast to a sign on the opposite shore.
3. That portion of Port Graham east of a line extending from Dangerous Cape to the western edge of Passage Island thence to the nearest waterfall on the southern shore of Port Graham.

This regulation shall become effective July 15, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mascham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Axel Ursin, Seldovia
Snug Harbor Packing Co.

U. S. Post Offices
Homer
Seldovia
Seward
Kenai

July 19, 1961

FIELD ANNOUNCEMENT

Justification:

Tutka Bay lagoon has received adequate escapement.

Now therefore the following emergency regulation is adopted:

Section 109.21 Closed waters, (k) shall be amended to read:

(k) In all other salmon streams within 500 yards from the terminus or as posted. Stream markers at Tutka Bay lagoon stream will be moved inward to the stream mouth at salt water.

This regulation shall become effective 6:00 a.m., June 20, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Axel Ursin, Seldovia
Snug Harbor Packing Co.

U. S. Post Offices
Homer
Seldovia
Seward
Kenai

July 22, 1961

F I E L D A N N O U N C E M E N T

Justification:

Section 109.05 Open fishing season, salmon.

(d) Outer district. To be opened and closed by field announcement.

Certain portions of the Outer district now contain fish in sufficient numbers to warrant a fishery.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(d) shall be amended to read:

(d) Outer district.

(1) All waters east of and including Port Dick to the boundary of the Eastern district at 149° 30' W. long., from 6:00 a.m. July 24, 1961 until closed by field announcement

(2) All waters west of the entrance of Port Dick to the boundary of the Southern district at Point Adam will remain closed until opened by field announcement.

This regulation shall become effective 6:00 a.m., July 24, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mascham
Ben L. Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
Seldovia
Kenai
Seward

July 28, 1961

F I E L D A N N O U N C E M E N T

Justification:

1. Escapement is proceeding satisfactorily.
2. Fishing effort has been greatly reduced in the Northern, North Central, and South Central districts due to the cessation of the red run.

Now therefore the following emergency regulation is adopted:

Section 109.06 Weekly fishing periods.

The periods open to commercial fishing are as follows:

(a) Shall be amended to read:

- (a) In the Northern, North Central, and South Central districts from 6:00 a.m. Monday until 6:00 a.m. Saturday.

This regulation shall become effective 6:00 a.m., July 30, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Meacham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin
Emerd Packing Co.
Kenai Packers
Columbia-Ward Fisheries

U. S. Post Offices
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Kenai
Seward

August 1, 1961

FIELD ANNOUNCEMENT

Justification:

Port Dick and Taylor Bay Streams have not received adequate pink salmon escapement.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(d) Shall be amended to read:

- (1) All waters east of Point Gore to the boundary of the Eastern district at 149° 30' W. long., from 6:00 a.m. July 31, 1961 until closed by field announcement.
- (2) All waters west of Point Gore to the boundary of the Southern district at Point Adam will remain closed until opened by field announcement.

This regulation shall become effective 3:00 p.m., July 29, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Meacham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
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Kenai
Seward

August 1, 1961

F I E L D A N N O U N C E M E N T

Justification:

Ursus Cove is not receiving adequate escapement.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(c) Shall be amended to read:

(c) Kamishak Bay district.

- (1) Ursus Cove, west of a line between Ursus Head and Tignagrik Point, will remain closed until opened by field announcement.
- (2) The remainder of the Kamishak Bay district will remain open until closed by field announcement.

This regulation shall become effective 6:00 a.m., August 3, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
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Kenai
Seward

August 1, 1961

FIELD ANNOUNCEMENT

Justification:

The Outer district of Cook Inlet is not receiving adequate escapement.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(d) Shall be amended to read:

(d) Outer district: Closed until opened by field announcement.

This regulation shall become effective 6:00 a.m., August 2, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Meacham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
Seldovia
Kenai
Seward

August 7, 1961

F I E L D A N N O U N C E M E N T

Justification:

Escapement is now proceeding satisfactorily in certain areas of the Outer district.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(d) Shall be amended to read:

(d) Outer district

- (1) Windy Bay, West of 151° 27' 30", and Port Dick, from 12 noon, August 8, until closed by field announcement.
- (2) The remainder of the Outer district will remain closed until opened by field announcement.

This regulation shall become effective 11:00 a.m., August 7, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mascham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
Seldovia
Kenai
Seward

August 12, 1961

FIELD ANNOUNCEMENT

Justification:

Salmon surplus to spawning needs in Port Dick and Windy Bay in the Outer district have been caught.

Now therefore the following emergency regulation is adopted:

Section 109.05 Open fishing season, salmon.

(d) shall be amended to read:

(d) Outer district

(1) Closed until opened by field announcement.

This regulation shall become effective 6:00 a.m., August 13, 1961.

ALASKA DEPARTMENT OF FISH AND GAME

C. A. Weberg, Area Mgmt. Biologist
Cook Inlet Area Office

cc: C. L. Anderson
Walter Kirkness
C. H. Mescham
Ben Hilliker
E. B. Martin
Howard Marks, M/V Auklet
R. Charles Wilson
Don Roberts
Roy Jackson, INPFC

Canneries
Seldovia-Port Graham Consolidation
Snug Harbor Packing Co.
Axel Ursin, Seldovia

U. S. Post Offices
Homer
Seldovia
Kenai
Seward

October 12, 1961

EMERGENCY REGULATION

Justification:

No commercial fishery has existed on Dungeness crab in the Southern District of the Cook Inlet Area for approximately nine years. During these years commercial numbers of Dungeness crab have not been present. Regulations promulgated for the crab fishery of this Southern District in recent years, including 1961, have been intended to apply to king crab.

A gradual increase of Dungeness crab has been obvious in the Southern District for several years. It appears probable that a commercial Dungeness crab fishery is now feasible.

There are economic reasons why the regulations that apply to the king crab fishery of the Southern District should not apply to a Dungeness crab fishery.

Now therefore, the following emergency regulation is adopted:

Section 109.70 Legal gear, crabs, shall be amended to read:

(a) King Crab

(1) When fishing for or taking crab, in the Southern District, no individual shall operate, assist in operating, or have on board more than 30 pots or ring nets in the aggregate.

(2) All floats and buoys fished under any registration number must be identically marked, and the colors and design used must be registered with the Department before fishing commences.

(3) All pot and ring net buoys fished under a single registration shall be consecutively numbered starting with the number one (1), and they shall be legibly marked with the permanent Department registration number.

(4) In Kachemak Bay west of a line drawn through the longitude of Dangerous Cape and Anchor Point and in all other districts, crab may be taken by means of pots, ring nets and trawls.

Cook Inlet Emergency Regulation No. 23 - Continued

(5) In Kachemak Bay east of a line drawn through the longitude of Dangerous Cape and Anchor Point, crab may be taken by pots and ring nets only: Any crab taken by means other than pots or ring nets must immediately be returned to the water unharmed.

(6) The use of trawls in Kachemak Bay for obtaining bait is restricted to the area south of a line drawn from Point Pogibshi to Glacier Spit, and extending along the most northerly points on Yukon and Gull Islands.

(b) Dungeness Crab

All pot and ring net buoys fished under a single registration shall be consecutively numbered starting with the number one (1), and they shall be legibly marked with the permanent Department registration number. These floats and buoys must be constructed or marked in such a way as to be readily distinguishable from the floats or buoys used on king crab pots.

ALASKA DEPARTMENT OF FISH AND GAME
Walter Kirkness, Commissioner

by:

Stanley D. Swanson, Director
Division of Commercial Fisheries

cc: W. Kirkness
S. Swanson
C. Meacham
J. Rearden
B. Hilliker

U. S. Post Office
Homer
Seldovia

OBSERVATIONS ON OFFSHORE SEISMOGRAPHIC WORK

COOK INLET

1961

BY

ROBERT M. MOSS

The following excerpts are from a formal report filed in the Homer office by Mr. Robert M. Moss, who was employed as biologist-observer during April and May to oversee the Standard Oil Company of California's offshore seismographic exploration that occurred in Cook Inlet this year.

Mr. Moss was uniquely qualified for the work he accomplished, for he holds a degree in fisheries, and has been a commercial fisherman in the Cook Inlet area for many years.

INTRODUCTION

On April 6, 1961, Standard Oil Company of California applied for an Aquatic Seismic Exploration Permit to conduct a seismic survey in Cook Inlet, Alaska, adjacent to Kenai Peninsula, between Clam Gulch and Ninilchik. Operations were planned to commence about April 18, and to be completed by May 20, 1961.

The shooting lines were all to occur within three miles of the shore line, with the exception of one line that extended out for seven miles. Although these lines were subsequently changed at least four times, they did remain within the above area. A total of 45 miles was to be run by the seismic crews.

Standard Oil Company of California requested waiver of provisions (c) (2) and (f) in the standard Alaska Department of Fish and Game Aquatic Seismic Exploration Permit. (See appendix) Provision (c) (2) stipulates that a boat or crew shall be provided solely for the observer . . . Provision (f) stipulates that the holder of a permit shall notify the Department of Fish and Game, in writing, a minimum of twenty-one (21) days before beginning operations . . .

On April 13, 1961, an Aquatic Seismic Exploration Permit, for the period of April 18 to May 20, was issued to Standard Oil Company of California as per their request, with the following exception: Section (c) (2) will be retained, conforming to the Alaska Department of Fish and Game policy of maintaining an observation boat with aquatic seismic surveys, where damage to fishery resources may occur. However, section (f) was waived.

United Geophysical Corporation was contracted by Standard Oil Company of California to conduct the survey. Most of the seismic crew, known as Party 19 for this operation, were brought in from California and the Gulf States, being experienced in off-shore work. This was particularly true in the key positions such as party chief, shooter and recording man.

The only previous seismic work in Cook Inlet was conducted over a period of four months, from late January to May 24, 1959. It was a comprehensive survey covering the major portion of Cook Inlet, whereas, this operation was to be completed in an estimated 8 or 9 days and only to cover some 70 square miles of the Inlet. However, from the viewpoint of the contractor, and Alaska Fish and Game Department's observer, the main difference was in the type of boats used. This limited survey did not warrant bringing up specialized seismic boats such as those used in 1959. Five fishing boats were chartered for this purpose. The observer strongly feels that other similar small scale operations will be carried out in the future; utilizing such vessels and experiencing, to some extent, the same problems that occurred during this survey. Thus, as an aid for future Alaska Department of Fish and Game observers, this report covers in some detail the daily operations, activities, and delays experienced by the observation vessel and assigned biologist.

METHOD OF OPERATION

The SHIRLEY, of Petersburg, a 48 foot halibut-seine type combination boat, was chartered to bring the powder up from Seattle. She remained as the "shot boat."

As recording boat, the PACIFIC PEARL, a seiner-dragger from Kodiak, had two plywood houses installed by the contractors. The one placed aft of the deck house contained the recording instruments and developing tanks. The second, located on the flying bridge, was used by the shoran technicians; who, using radio to their shore stations, plus sights taken on the explosion and tail boat, accurately determined the shots exact location. At the termination of the survey, these houses were removed for trucking to Anchorage. It was

noted that the recording instruments must remain mounted in position so that subsequent "play backs" and filtering of the recordings will not be affected by any changes. This "reworking" of the records was done in Anchorage after the survey. Thus, the house, weighed down by instruments, must be lifted off by use of a suitable hoist or winch.

The CELTIC, like the PACIFIC PEARL, was around 70 feet long. She acted as the tail boat during most of the operation. Her normal occupation is that of a salmon tender in Cook Inlet. Part of the seismic crew ate and slept aboard this boat.

The CAROL ANN, a shallow draft Kodiak type beach seiner from Seldovia, was used as the tail boat at the start of the program, with the CELTIC as wing boat. However, the tidal currents proved too strong for a wing cable and the CAROL ANN's charter was terminated on May 1.

The observation boat, MELODY, a 46 foot halibut-drag combination boat from Homer, carried a 16 foot outboard speeder on deck. The MELODY, as well as the other boats, was equipped with a recorder or depth indicator and mutual frequencies for ship to ship communication. In addition, the shore stations, recording boat, and shot boat had a separate high frequency FM short range communications.

The actual operational procedure, including readying charges, coordinating shooting, and resulting explosion, were much the same as those reported by Weberg and Rearden, Observations on Offshore Seismographic Work in Alaska, January-June 1959. There were, of course, some differences due to the non-specialized boats used, urgency of the survey, and physical features of the involved area:

1. The cable, with geophones, was brought aboard and coiled on deck instead of the reels used on regular seismographic boats. This meant the transfer

of men from another boat, generally the shot boat, to the recording boat to aid in recovering the cable. Usually less than half an hour was needed to bring the cable aboard.

2. After two days of shooting, the 900 foot wing cable was eliminated, and the tail cable lengthened to 2,900 feet.

3. All powder used, except for four test shots of nitramon, consisted of Hercules EP-198-B. EP-138 (Hercules Co.) was not available in time for the operation.

4. Normally, three cans (cylindrical 36" x 10") containing 45 pounds per can were tied together, armed and fired by Hercules Vibrocap electric blasting caps. These heavier charges of powder required two plastic bag floats instead of one. Other size shots ranged from one to four cans.

5. No permission was requested for refraction shots.

PROBLEMS DUE TO HYDROGRAPHIC AND GEOGRAPHIC CONDITIONS

The area surveyed lies adjacent to a recent exploratory well, which Standard Oil Company of California drilled on shore. Operational plans called for the tail boat to tow the cable as close to shore as possible before starting to shoot a line. The bottom topography of this area is gradually shelving, with scattered unmarked boulders, some of which are 20 or more feet high. The maximum range of tide which occurred was about 25 feet. There was an understandable reluctance, on the part of the boat captains, to run too close into the beach. Most of the inshore work was done on high water slack and before the tide ebbed appreciable. Depths of water shot over ranged from 15 feet to 86 feet, with the average around 35 feet. In spite of the strong tidal currents and dangerous bottom conditions noted above, the only incident occurred when the recording

boat ran onto the sand bar off Ninilchik. No damage resulted to the boat and it refloated in a few minutes.

Although boats and crews familiar with this area were chartered in order to utilize their local knowledge of the adverse conditions, full advantage was not taken until the last few days of shooting. None of the seismic crews seemed to have worked in strong currents such as prevail in Cook Inlet. During the last two days, a much wiser use was made of the slack water periods; resulting in twice as much being accomplished in the same length of time.

The weather remained unusually calm during the actual time spent in the seismic area which greatly aided the shooting, as well as aiding in the transfer of personnel between boats and shore.

OBSERVATIONS AND FISH KILL

The main function, of course, of the biologist is to inspect each "boil" for marine kill and ascertain if the damage warrants a curtailment of the survey; either by moving to another line, modifying, or stopping the shooting. The observer for the Alaska Department of Fish and Game, Robert Moss, did not see any fish of commercial or food value injured during the entire operation. Particular care was taken for two reasons:

1. Adult king salmon were known to be present in Ninilchik River a week prior to termination of the seismic program.
2. It seems reasonable to assume that there could be seaward migration of salmon smolts along the shore throughout the permit area. Kasilof River, 15 miles, and Kenai River, 25 miles, north of the shooting area, are important Cook Inlet spawning drainages. However, no smolts were seen although the weather permitted unusually good observation.

The only two species observed killed were tomcod (Microgadus proximus) and herring (Clupea pallasii). There were very few explosions that failed to kill or stun at least a few herring. Except in two instances, these herring were 2½ to 3 inches in length. Nearly all showed a pronounced hemorrhaging on the top and rear portion of the head. Two 9 inch herring were killed, one in each of two explosions. The total observed kill of herring (Clupea pallasii) during the seismic program was approximately 1,350. Occurring at scattered intervals, during the survey, was an observed kill of 24 tomcod (Microgadus proximus) ranging in size from 7 to 14½ inches. (See Appendix)

There were several things which the observer noted with interest, although the area and duration of the program was much too limited to draw any conclusions:

1. The herring appeared to be somewhat more prevalent in the shallower water, on the southern or Ninilchik end of the shooting area.

2. Twice, herring of about 9 inches in length, jumped clear of the water in front of the observation boat at the time of an explosion. This occurred at approximately 200 yards from the explosion. Subsequent examination of the boil resulted in picking up a killed herring 9 inches in length. At no time were any of the smaller herring (2½" to 3") seen breaking the water surface at the time of an explosion.

3. A charge of 90# broke from the floats and sank in 4 fathoms of water. The resulting explosion did not erupt as a geyser but did cause a large boil. This sunken charge appeared to be particularly destructive to the small herring present and caused deaths up to an estimated 200 feet from the center of the boil.

4. Sea gulls were present off and on; but they showed little interest in the boils, except on several occasions. Even after picking up fish from an

explosion they failed to follow up on the next shots.

5. The water was extremely muddy, particularly close to the shore line. Difficulty was encountered seeing the small herring except when they were on their sides. In one instance a boil was slowly drifted through by the observation vessel with 5 small herring observed. Two gea gulls "worked" the boil following the boat and were seen to pick up over twenty fish.

6. In an effort to pinpoint a technical difficulty, Standard Oil Company of California requested permission to make several test shots of nitramon, interspersed with EP 198 B for comparison. Permission was granted by the Anchorage office of the Alaska Department of Fish and Game, providing it took place in the middle of the Inlet, south of Kalgin Island. During the 9 test shots, of which 4 were nitramon, that took place at 60° 10' 20" N, 152° 10' 00" W, depth 144 feet, there was no observed fish kill with either EP 198 B or nitramon.

7. Charges of powder varied from 90# to 180# of EP 198 B during this seismographic program. Most shots were made up of 3 cans (135#) however. The fish mortality appeared to vary more as to where the shot was made, rather than the amount of powder involved. There was a total of 218 shots made during the entire operation. (See Appendix for the daily fish kill.)

Equipment carried aboard the observation vessel for picking up dead or stunned specimens was simple and proved adequate. It consisted of two dip nets, on six to eight foot handles. The mesh size was 1 inch shrimp web and proved sufficient to retain even the smallest of the herring encountered. Several times cheese cloth netting was placed over the larger mesh and dragged through the boils. Some unburnt powder was netted, as well as several small decapods that appeared to be in good condition.

Other equipment included the usual preserving formaldehyde, bottles, and tags. A hand lead, capable of being armed to take bottom samples as well as depth, was used occasionally.

NON-BIOLOGICAL USE OF THE OBSERVATION VESSEL

The purpose of chartering an observation vessel is for the state biologist to use in overseeing the seismic operation. Full authority of the boat's use, in accomplishing this, rests with the observer. However, before and after shooting hours the observation vessel's function changed for the following reasons:

1. It did not conflict with the vessel's use by the biologist.
2. Being chartered by Standard Oil Company of California, to meet the state's requirements, it undoubtedly seemed logical for them to obtain as much use from the vessel as possible.
3. Primarily, however, it was the only vessel equipped with a suitable outboard powered speeder that could be easily launched, and was also seaworthy enough to transfer personnel to and from shore as well as between boats.

This operation, due partly to the unfamiliar technical problems encountered, resulted in many conferences and personnel exchanges which required the use of the observation vessel's speeder. To illustrate the use of the observation vessel and its speeder, in its "non-biological" function, the MELODY's daily log for May 10th is included in the Appendix.

The speeder was originally taken by the observation vessel for use in very shallow waters. However, the observation boat was able to follow the shot boat at all times.

Rarely will offshore seismographic work occur in Alaska that will be as

convenient to transportation and communication, that seems so essential to these programs, as was in this operation.

CHANGEABLE NATURE OF THIS SEISMIC OPERATION

Admittedly, this observer presumes much in indication that this particular operation could be called typical in the respect of plan changes. However, by nature of the work, it may not be an unusual offshore seismographic characteristic.

Daily activities of the seismic vessels are covered in the Appendix section which will show the changes in plans and also the changing nature of a seismic program. This is something that a biologist observer is confronted with, in addition to his biological duties.

RECOMMENDATIONS

The observer fully concurs with the recommendations set forth by Rearden and Weberg in their comprehensive report covering the offshore seismographic work in Alaska, January to June, 1959. In addition, particularly during operations such as the one just completed, there are occasional periods of time during which the biologist is not busy observing actual explosions. Perhaps such periods could be put to some practical use by obtaining information of a hydrographical or biological nature that would eventually be a source of help in managing or harvesting resources in a particular area. This could be accomplished by use of a minimum amount of gear, utilizing small mesh nets for plankton and larger pelagic forms. Hand sounding devices, such as a hollowed lead, would gather much bottom information in the course of a seismographic program.

To a biologist confronted for the first time with the task of monitoring

an offshore seismographic program of the foregoing nature, these suggestions may well prove helpful:

1. Arrange for a biologist, with prior seismic observation experience, to accompany you during the first day or two. Mr. Jim Rearden was extremely helpful during the period of time he spent aboard at the start of this operation.

2. Determine exactly what types of powder are carried on the shot boat and in what amounts. This applies particularly to nitramon or other powder not specifically covered in the seismic permit. It can probably easily be done by visiting with the crew on the powder or shot boat.

3. The use of 7 x 50 binoculars is extremely helpful in determining exactly what charges are next in position on the shooting platform. The explosions varied to a large degree on this operation due to:

- a. Inconsistent deflagrating of EP 198 B.
- b. Partial detonating when using a multiple number of cans and vibrocaps.
- c. Various depths of detonation used in an effort to obtain useable recordings.
- d. Different methods of suspending the cans from the floats.

Thus, an observer with little or no experience in the type of explosions resulting from different powder, might have difficulty determining after detonation, if an unauthorized type was used. Although no such violation occurred on this operation, the possibility is always present.

4. Establish through the party chief who is responsible for sinking duds.

5. Inform the party chief early in the program, that if the observation boat or biologist is absent from the operation, shooting may not be conducted.

This will tend to reduce errand runs by that vessel.

6. Notify the party chief, in advance, when and where commercial fishing gear may be encountered.

7. For the observers own information and protection, keep a detailed log of the activities of the observation vessel as well as the shots which resulted in fish kills.

8. If requested, grant permission to dispose of left over powder by detonation, only in amounts conforming to the permit.

APPENDIX I

DAILY FISH KILL

<u>Date</u>	<u>Herring*</u>	<u>Tomcod*</u>
April 28	20	1
April 29	333	0
May 3	319	0
May 4	143	4
May 9	0	0 (9 test shots)
May 10	265	14
May 11	157	4
May 12	<u>113</u>	<u>1</u>
Total	1,350	24

* Herring - (Clupea pallasii)

* Tomcod - (Microgadus proximus)

FISHERMEN'S CORNER

For the second straight season the six-day a week radio spot on commercial station KENI was continued. The program keeps Cook Inlet's commercial fishermen informed of fishing conditions and regulation changes. The set net fishermen especially have come to depend on the program. Copies of the material presented are forwarded to both the Juneau and Anchorage offices, thus helping other Department personnel to keep informed of Cook Inlet's fishery.

The program will probably continue to be aired each summer season.

NEEDS FOR FUTURE

1. Accurate and up-to-date figures on escapement of red salmon (primarily) into major drainages of Cook Inlet is the single greatest need existing today for proper management of the area's salmon fishery. The development of sonar equipment for making such counts has been started.
2. Evaluation of spawning results, in order to help make predictions of some accuracy on returning runs of salmon, should be started in Cook Inlet. This is going to require more permanent personnel. Egg pumping techniques and downstream smolt stations take time and need undivided attention; the present staff cannot hope to do this work with all of the other duties that are presently required.
3. At the time of this writing warehouse, office, and parking space are badly needed, as reported in the 1960 Annual Report. However negotiations are under way for a building to be leased by the state, and which will include the requirements needed by the Commercial Fisheries Division at Homer.
4. The Cook Inlet Commercial Fisheries Area encompasses over 50,000 square miles. Within the area reside nearly 200,000 persons. It is impossible for three biologists to adequately deal with all of the problems that arise with this number of people.

Continual road construction and bridge building, seismic exploration, pipe laying, hydraulic mining, logging, water diversion, pollution, poaching, blocking of streams in various ways to salmon runs, are absolutely impossible to deal with properly. One of the vital spawning grounds in the area is almost unknown because of the critical lack of personnel . . the Susitna basin. During the past two seasons temporary personnel have had to do the work in that area. This is unsatisfactory, but there has been no choice.

More permanent personnel must be hired in the Cook Inlet Commercial Fisheries Area if stocks of salmon are to be preserved.